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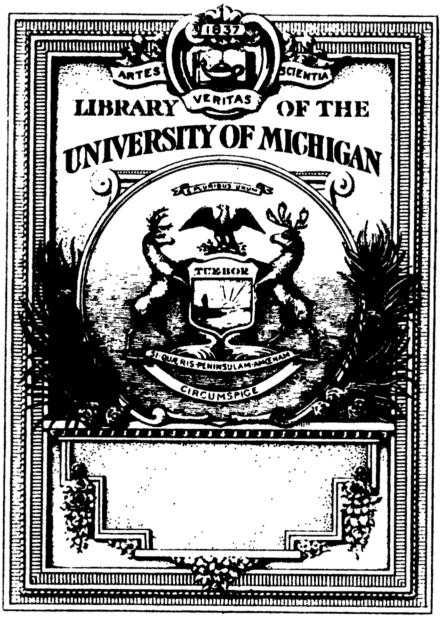

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THE PHILIPPINE JOURNAL OF SCIENCE

VOLUME 28

SEPTEMBER TO DECEMBER, 1925
WITH 51 PLATES AND 18 TEXT FIGURES

MANILA
BUREAU OF PRINTING
1925

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BUREAU OF SCIENCE
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THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science of the Government of the Philippine Islands

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Publications sent in exchange for the Philippine Journal of Science should be addressed: Library, Bureau of Science, Manila, P. I.

The Journal is issued twelve times a year. The subscription price is 5 dollars, United States currency, per year. Single numbers, 50 cents each.

Subscriptions may be sent to the BUSINESS MANAGER, Philippine Journal of Science, Bureau of Science, Manila, P. I., or to any of the agents listed on the third page of this cover.

THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 28 SEPTEMBER, 1925 No. 1

INTESTINAL NODULES IN CHICKENS DUE TO HETERAKID LARVÆ (HETERAKIS BERAMPORIA LANE)

By BENJAMIN SCHWARTZ[1]

Of the Zoölogical Division, Bureau of Animal Industry, United States Department of Agriculture

ONE PLATE

INTRODUCTION

In the course of post-mortem examinations of chickens (*Gallus domesticus*) in Los Baños, Laguna Province, Philippine Islands, I frequently found nodules in the wall of the cæca associated with the presence of adult heterakids in the lumen. Nodules from different host animals were dissected at various times and in practically all cases nematode larvæ were found in them, a single larva having been found in each nodule. The larvæ were very active in physiological salt solution in which they performed wriggling movements for some time after their liberation from the nodules.

Recent examination of the adult heterakids obtained from chickens containing cæcal nodules showed that the parasites in question agree with the description of *Heterakis beramporia* Lane, 1914, to which species they doubtless belong.

---

[1] The note on Microscopic Findings is by Robert J. Formad, pathological division, Bureau of Animal Industry, United States Department of Agriculture.

LANE'S DESCRIPTION OF HETERAKIS BERAMPORIA

Lane gives the following description of *Heterakis beramporia*: Œsophagus, 0.745 millimeter long; first part, 0.045 millimeter; second part, 0.5; third part, 0.2. Nerve collar, 0.225 millimeter; cervical papillæ, 0.38 from cephalic end. Excretory pore, 0.35 from cephalic end.

Males straight with the exception of a curve, dorsad, at head end; 5.5 millimeters long by 0.24 wide. Sucker circular, 0.055 millimeter in diameter. Spicules of nearly equal length but different in shape, the right spicule 0.35 millimeter long, with a tapering point, and the left spicule 0.3 long, expanding "in its peripheral third" and bearing near the point a prominent angle on its ventral aspect.

Females are 6.6 millimeters long, with a maximum diameter of 0.03, and have a dorsad cephalic curve, and at about the level of the vulva they somewhat abruptly start a curve, ventrad. Vulva opens practically at equator, a valvular flap projecting cephalad over the opening. The anus is 0.66 millimeter from the tip of the tail.

The worms were collected by Lane from the cæca of domestic fowls in Berhampore, Bengal, India. Lane states that these parasites produce no lesions of the cæcal wall so far as his experience goes.

In view of the fact that I found pronounced nodules in the wall of the cæca of chickens harboring the adult parasites, I made a careful comparison of my specimens with Lane's description of *Heterakis beramporia,* with a view to discovering possible differences, and obtained the following results:

MY OBSERVATIONS ON HETERAKIS BERAMPORIA FROM THE PHILIPPINES

Male.—The male is from 5.2 to 5.5 millimeters long by 0.25 in maximum width, in the region at the base of the œsophagus. The diameter of the body immediately below the lips is 0.05 millimeter. It is curved in outline with a curve, dorsad, at the head end. Plate 1, fig. 1, shows an outline drawing of a male and a skeleton outline drawing of another specimen; the latter is decidedly sinuous in outline. According to Lane the males are straight with the exception of the curve, dorsad, at the head end. I have not found any males corresponding to that description. While the curve, dorsad, at the head is undoubtedly a diagnostic character of this species, the curvature of the rest of the body is dependent upon the state of contraction of the worm at the time it is killed and is, in my opinion, without significance. The œsophagus is 0.63 millimeter long and 0.12 to 0.15 wide at the bulb. The first part of the œsophagus measures 0.034 millimeter; the last part, 0.18. The nerve collar is 0.205 millimeter from the cephalic extremity, and the excretory pore is 0.33 millimeter from the same point. The cervical papillæ are located 0.345 millimeter from the cephalic extremity.

The sucker (Plate 1, fig. 2) is circular and varies from 0.058 to 0.064 millimeter in diameter. The distance from its caudal end of the cloacal opening is 0.12 millimeter and thence to the last papilla 0.18. The distance from the last papilla to the tip of the tail is 0.2 millimeter. These measurements agree closely with those given by Lane. The papillæ show the same arrangement as indicated in Lane's Plate 75, fig. 1. Their arrangement as seen in lateral view is shown somewhat diagrammatically in Plate 1, fig. 3. The spicules are nearly equal in length, and in my specimens the anterior end of the left spicule is at least 0.14 millimeter posterior to the anterior end of the right spicule, the latter terminating in the region of the cloaca and the former being extruded through the cloacal aperture. The left spicule bears a prominent angle on its ventral aspect. The right spicule has a long tapering point. The lengths of the spicules are as follows: Right spicule, 0.35 millimeter; left spicule, 0.3 (Plate 1, fig. 7).

Female.—The females have a cephalic curve, dorsad (Plate 1, fig. 6); the curvature of the rest of the body is variable. Several measured specimens were found to vary from 6.3 to 6.7 millimeters in length, and the maximum width, measured in the region of the base of the œsophagus or somewhat behind that region, varies from 0.225 to 0.26 millimeter; the maximum width observed in any female was about 0.28. The diameter of the body immediately below the lips varies from 0.05 to 0.06 millimeter; in the region of the vulva, from 0.2 to 0.22.

In one specimen the nerve ring is located 0.225 millimeter from the cephalic extremity and in another 0.242 from that point. The excretory pore is located 0.345, 0.326, and 0.309 millimeter, respectively, from the head end in three different specimens. The cervical papillæ are located about 0.03 millimeter posterior to the excretory pore (Plate 1, fig. 5).

The length of the œsophagus varies from 0.68 to 0.72 by 0.12 to 0.15 millimeter in its maximum width at the bulb. The first part of the œsophagus is 0.43 millimeter long and the last part is from 0.18 to 0.2 millimeter long. The vulva is located somewhat posterior to the equator of the body. In three specimens the ratio of the part of the body anterior to the vulva to that posterior to the vulva was found to be as follows: 352 : 296; 339 : 320; 348 : 279. Immediately caudad of the vulva is a cuticular flap which projects over the opening (Plate 1, fig. 4). The distance from the anus to the tip of the tail is from 0.067 to 0.068 millimeter.

The ova measure 0.05 to 0.06 by 0.25 to 0.03 millimeter. Lane's measurements for the ova are 0.05 by 0.03.

Allowing for individual variations, the specimens of *Heterakis* from the Philippine Islands agree in all respects with Lane's description of *Heterakis beramporia* and it must, therefore, be concluded that this species is capable of producing serious injuries to the cæcal wall, although in Lane's experience in India no lesions were observed.

CÆCAL NODULES IN BIRDS DUE TO HETERAKIDS, OBSERVED BY VARIOUS WRITERS

According to Lucet and Henry (1911), Klee (1891) first noted intestinal nodules in pheasants, and Railliet and Lucet (1892) described this condition in pheasants as a verrucose typhlitis. Railliet and Lucet found small heterakids in the mucosa of pheasants and noted a marked dilatation of the cæcum of affected birds. These writers considered the worms in question to be *Heterakis papillosa* (= *Heterakis gallinae*). This condition in pheasants was noted later by Galli-Valerio (1896), Klee (1897), Letulle and Marotel (1901) who described the pathology of these nodules, and Sambon (1908). Lucet and Henry (1911) state that, although previous writers considered *Heterakis gallinae* to be the cause of intestinal nodules in pheasants, the specific determination of the parasite was found to be faulty in the cases that they reëxamined; namely, those of Railliet and Lucet (1892), Letulle and Marotel (1901), and Sambon (1908). In these, as well as in the cases of verrucose typhlitis in pheasants described by them, the parasite in question, according to these writers, is *Heterakis isolonche* von Linstow, and it would appear that references in the literature to *Heterakis gallinae* as a cause of intestinal nodules in birds is probably due to misidentification of the parasite. The cases described by Lucet and Henry are very interesting in as much as these writers record not only larval worms in cæcal and intestinal nodules of pheasants but also adult forms, including egg-laying females.

Recently I had an opportunity to examine portions of cæca from a pheasant that were forwarded to the zoölogical division of the United States Bureau of Animal Industry in March, 1921, by Dr. Fred Boerner, of the Pennsylvania Department of Agriculture. Doctor Boerner stated that the pheasant was autopsied in his laboratory and that—

> no definite cause for the death was found unless it be the condition of the cæca. These showed throughout their entire length nodules such as are in evidence in the samples submitted, and in each of the nodules that was opened there was found a worm. Worms were also present in the lumina of the cæca.

In the material submitted by Doctor Boerner numerous nodules were clearly visible through the serous coat; the nodules were very close together in certain portions of the cæcal walls. Several of these nodules were opened and a worm was extracted from each nodule, apparently fully grown but sexually immature, since no eggs were found in any of several female specimens that were examined. These worms correspond to the description of *Heterakis isolonche* von Linstow, a species that has not heretofore been reported from the United States.

The nodules from the cæca of pigeons are not only more numerous and more closely crowded together but also larger and far more conspicuous than those that I found in the cæca of chickens infested with *Heterakis beramporia.* The discrepancy in size of the nodules, due to the fact that two different species of *Heterakis* were represented, may be accounted for by the fact that *Heterakis isolonche* develops to a far larger size in the nodules than does *Heterakis beramporia,* since the larvæ of the latter species isolated from nodules were always microscopic in size.

In the light of our present knowledge it may be concluded that *Heterakis isolonche* von Linstow is the agent responsible for nodule formation in pheasants and that the only other species of *Heterakis* thus far known to be capable of causing nodules in birds is the species dealt with in this paper; namely, *Heterakis beramporia.* No definite nodule formation due to *Heterakis gallinae* has been recorded, although recent investigations on the life history of this parasite show that in its larval stages it has decided tissue-invading powers, and that the adults occasionally push the anterior part of the body into the intestinal mucosa. Thus, Graybill (1921) found larvæ of *Heterakis gallinae* in the wall of the cæcum, although he failed to find any evidence of encystment. Uribe (1922) found that larval *Heterakis gallinae* migrate into the cæcal glands and, from the second to the fifth day after feeding ripe embryonated eggs to chicks, no larvæ were found in the cæcal contents, although many were present in the scrapings of the mucosa. This writer found that after the fifth day the larvæ leave the crypts of the cæcal mucosa and develop in the lumen of the cæcum.

On the basis of our present knowledge we may distinguish three stages in tissue-invading powers in worms belonging to the genus *Heterakis,* namely: (*a*) invasion by early-stage larvæ of the cæcal glands for short periods without nodule formation, *Heterakis gallinae;* (*b*) invasion of the cæcal wall by larvæ with nodule formation, *Heterakis beramporia;* and (*c*) invasion of the cæcal wall by larvæ with nodule formation and development of the worms up to the adult stage in the nodules, *Heterakis isolonche.*

MICROSCOPIC FINDINGS [2]

Before describing the actual findings it may be of interest to consider the salient points in the structure of the cæca, where the parasitic infestation was observed. The fowl has two tubular cæca extending forward from their point of origin at the junction of the small and the large intestines. The average length is about 76 or 88 millimeters. The coats are the same as in the small intestine; namely, mucosa, submucosa, muscularis, and fibrous or serous coat. The walls are relatively thin and nearly semitransparent in the normal state, so that the intestinal contents can be made out if the walls are not hypertrophied from inflammation. Lymphoid tissue is usually present in the follicular form and less frequently in the diffused form or the diffused form combined with the follicular. It is generally located in the mucosa, often sinking into the submucosa and very rarely minute follicles may be found between the two inner circular and outer longitudinal muscular coats.

It is well known that the cæca of young chickens are frequently the starting point of coccidial infection and certain inflammatory conditions. The inflammatory changes are invariably confined to the mucosa and submucosa of the two coats which have the rich blood supply and the principal accumulation of lymphoid cells. The loose grouping of the lymphoid cells favors their mobility and offers a receptive soil for irritants to manifest their action.

---

[2] By Robert J. Formad.

The following conditions were observed on microscopic examination: The mucosa and submucosa were but slightly altered, consisting principally in an inconspicuous increase of lymphoid tissue. The follicles were somewhat hypertrophied and increased numerically. The principal changes were observed in the muscular coats. The intermuscular follicles were ordinarily very small clusters of lymphoid cells supported by a fine adenoid reticulum and surrounded by a thin connective-tissue capsule. The individual cells in the follicle were round and uniform in size, and they stained well with nuclear dyes. At the ends of the oblong patch the follicular masses could be made out here and there, but in the middle of the patch the cell mass had become so large that it appeared to be formed from the fusion of several follicles or the development of diffused adenoid tissue as the result of an irritant causing the cell proliferation, resulting in the blending with the follicles. The capsule was more pronounced, the original lymphoid cells were increased in size, had become irregular in shape, granular in appearance, and stained very poorly, indicating degenerative changes. Between the cells granular material had accumulated, resulting from disintegration of cells. Channels (spaces) were formed from the liquefaction and subsequent absorption of the degenerated material. In places eosinophiles were present. As eosinophiles often accompany parasitic affections, a systematic search in all the nodules in the serial sections was undertaken, which resulted in finding in some preparations that came near the end of the patch round and oval structures which proved to be transverse and oblique sections of larval worms, and sections from the central part of the patch showed longitudinal sections of a larval parasite (*Heterakis beramporia*).

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ILLUSTRATION

PLATE 1. HETERAKIS BERAMPORIA LANE

FIG. 1. Male and skeleton outline of a male specimen. (Original.)

2. Preanal sucker. (Original.)

3. Posterior end of male, somewhat diagrammatic. Ventral papillæ of the paracloacal group not shown in this view. (Original.)

4. Vulva, with projecting cuticular flap. (Original.)

5. Anterior portion of female; *cp*, cervical papilla; *exp*, excretory pore; *int*, intestine; *lp*, lip; *n*, nerve ring; *oes*, œsophagus. (Original.)

6. Female and skeleton outlines of two other females; *a*, vulva; *b*, anus; *c*, termination of œsophagus. (Original.)

7. Spicules. (Original.)

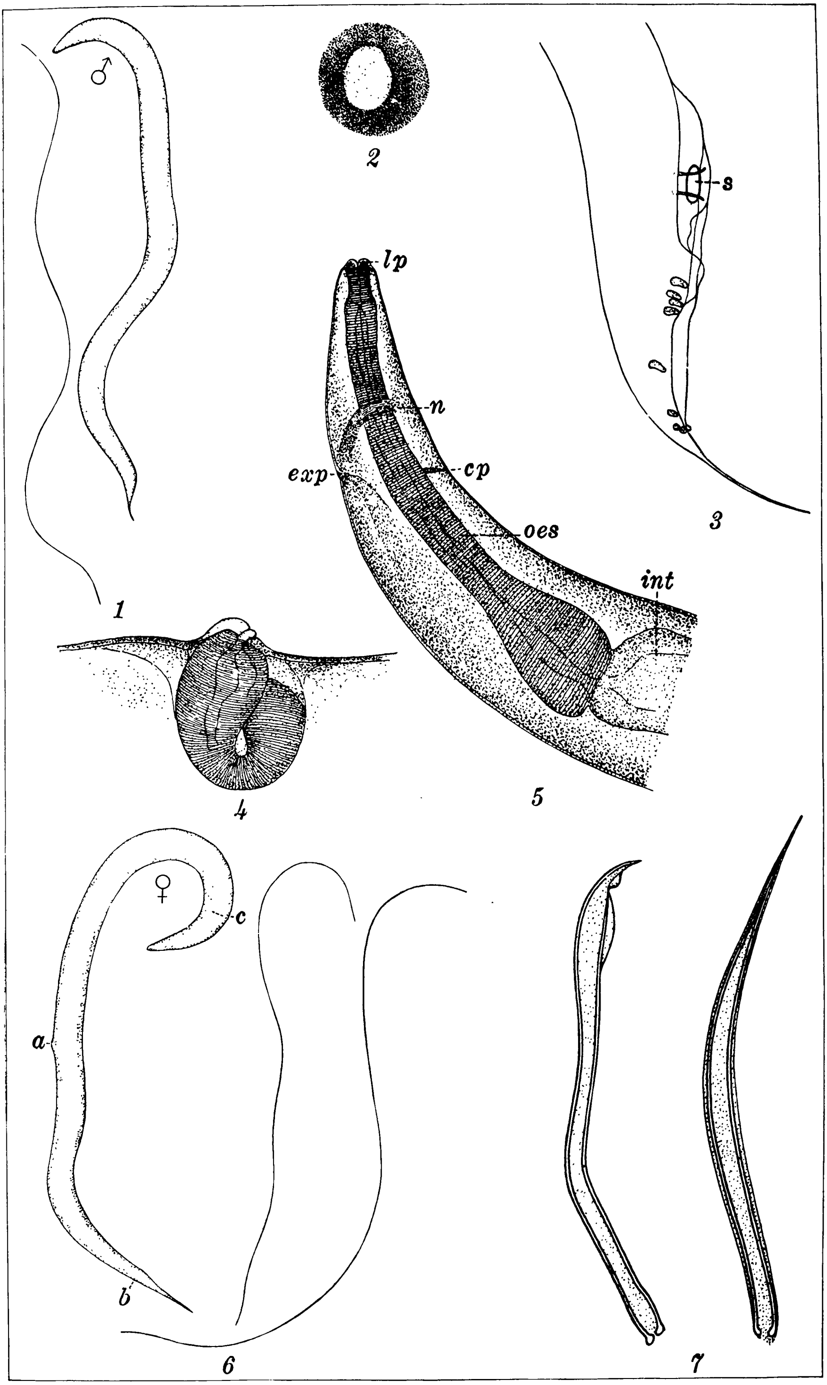

PLATE 1.

UNIV. OF MICH.

METAZOAN PARASITES OF PHILIPPINE DOMESTICATED ANIMALS

By Marcos A. Tubangui

Of the University of the Philippines, Los Baños

THREE PLATES AND TWO TEXT FIGURES

The parasitic worm fauna of domesticated animals in the Philippine Islands is very incompletely known. In fact, aside from the publications of Schwartz,(19, 20, 21, 22) Boynton,(4) Boynton and Wharton,(5) Wharton,(26, 27) and of a few other American investigators who have had opportunities to examine material through sendings for identification, there is scarcely any Philippine literature that deals with this important field of zoölogical research. The situation is unfortunate; more attention should be paid to parasites and parasitic diseases, for the reasons that parasites are of common occurrence and that native animals often suffer from their injurious effects.

The object of this paper is to record some parasitic worms that I have been able to identify from the helminthological collection of the College of Veterinary Science, University of the Philippines. These and other parasites, which have been previously reported by other writers, are found in the list given in this paper, which includes a total of eighty-one species. Five of these are new to science and are described in detail. The others are simply mentioned by giving what are considered their most nearly valid names.

The list is rather incomplete at present, especially as to the parasites of cattle, carabaos, sheep, and goats, owing to the scanty material at hand from these hosts.

Unless otherwise stated, the parasites dealt with in this paper were collected in Los Baños, Laguna Province, Luzon.

I desire to record my thanks to the following, whose interest or influence has aided in the accumulation of the helminthological collection at my disposal: Dr. Benjamin Schwartz, formerly of the University of the Philippines, Los Baños; Dr. C. H. Schultz and Dr. A. K. Gomez, of the College of Veterinary Science, University of the Philippines; Dean C. F. Baker and

Dr. B. M. Gonzalez, of the College of Agriculture, University of the Philippines; and Dr. Stanton Youngberg and Dr. Vicente Ferriols, of the Philippine Bureau of Agriculture.

Technic.—The presence of a large amount of moisture in the air during the greater part of the year in the Philippines renders the infiltration of nematodes with glycerine difficult and arduous. For this reason the Carnoy-phenol mixture recently recommended by Hetherington(13) was tried, and it has been found to give very satisfactory results. The method is quick and can be carried out under moist atmospheric conditions.

PLATYHELMINTHES

TREMATODA

FASCIOLIDÆ

FASCIOLINÆ

Genus **FASCIOLA** Linnæus, 1758

Fasciola hepatica Linnæus, 1758.

Hosts: Cattle, carabao, sheep, and goat.

Location: Bile ducts.

Localities collected: Manila, Laguna, Pampanga, and Occidental Negros.

Fasciola gigantica Cobbold, 1856.

Hosts: Cattle, carabao, sheep, and goat.

Location: Bile ducts.

Localities collected: Manila and Occidental Negros.

FASCIOLOPSINÆ

Genus **FASCIOLOPSIS** Looss, 1899

Fasciolopsis sp.

Host: *Bos* (*taurus*?).

Location: Intestine?

Locality collected: Manila?

I have not yet encountered this parasite in my post-mortem work. According to Garrison,(9) specimens of this worm were forwarded by the Philippine Bureau of Science to the United States Naval Medical School helminthological collection, where they bear the catalogue No. 142.

OPISTHORCHIIDÆ

OPISTHORCHIINÆ

Genus **OPISTHORCHIS** (R. Blanchard, 1895)

Opisthorchis felineus (Rivolta, 1884).

Host: *Felis catus* (*F. domestica*).
Location: Bile ducts?
Locality collected: Manila?

Garrison(9) states that specimens of this parasite sent by the Bureau of Science are listed under catalogue No. 144 of the United States Naval Medical School helminthological collection. The breed of the host animal is not known. If the specimens were obtained from a native cat, it is possible that they are identical with the next species.

Opisthorchis wardi Wharton, 1921.(27)

Host: Domestic cat.
Location: Bile ducts.
Locality collected: Manila.

DICROCOELIIDÆ

DICROCOELIINÆ

Genus **DICROCOELIUM** (Dujardin, 1845)

Dicrocoelium lanceatum Stiles and Hassall, 1896.

Host: *Bos* (*taurus*?).
Location: Bile ducts?
Locality collected: Manila?

As in the case of *Fasciolopsis* sp., I have not yet encountered this parasite among native cattle. Garrison mentions it as being listed under catalogue No. 143 of the United States Naval Medical School helminthological collection. The parasite was received from the Bureau of Science.

Genus **EURYTREMA** Looss, 1907

Eurytrema ovis sp. nov. Plate 1, fig. 1.

Host: Native sheep.
Location: Fat surrounding the rectum.
Type locality: Los Baños, Laguna Province, Luzon.

The location is unusual for a species belonging to this genus, the habitat of the other members of the genus *Eurytrema* being the pancreas or the pancreatic ducts of their hosts.

This species is closely related to *E. pancreaticum* (Janson) and *E. coelomaticum* (Giard and Billet) but the following characters serve to distinguish it from them: The worm is constricted on both sides at the level of the genital opening, thus producing a distinct shoulder which marks off a rounded anterior extremity; the œsophagus is very short or practically absent; the uterine coils are very closely packed; the uterus passes anteriorly dorsad to the acetabulum, beyond which it forms more loops than have been claimed for either *E. pancreaticum* or *E. coelomaticum;* and the testes are almost in straight transverse line with the acetabulum.

Specific diagnosis.—Body smooth, foliaceous, with wrinkled margins; anterior extremity roundly attenuated and set off from rest of body by a constriction on both sides at level of genital pore; posterior end acutely pointed, as in other members of the genus. In specimens fixed in corrosive sublimate with shaking, the total length is 10.5 to 12 millimeters; maximum width, across or near ovary, 4.6 to 5.4; maximum thickness, in median line through acetabulum, 0.7. In specimens compressed between two glass slides and fixed in corrosive sublimate, the maximum length is 14.6 millimeters; maximum width, 4.9. Suckers prominent and about equal in size; distance between them, measured from their centers, 3.5 to 4 millimeters; oral sucker subterminal, 1.5 to 1.7 millimeters long by 1.3 to 1.6 wide; ventral sucker, 1.3 to 1.5 millimeters long by 1.4 to 1.6 wide. Pharynx small, partly covered by oral sucker, 0.3 to 0.5 millimeter long by 0.3 to 0.4 wide; œsophagus very short or practically absent; intestinal cæca small in diameter, wavy in outline, in ventral view hidden for the most part underneath testes, vitellaria, and uterus, their blind ends terminating to about 1.5 or 1.7 millimeters from posterior tip of body.

Testes symmetrically placed, in straight transverse line with acetabulum; size, about 1 by 0.8 millimeter; lobulated, with from four to six lobes on each testis. Vasa efferentia short, one shorter than the other, due to position of cirrus sac to one side of median line; they meet on the anterior-external side of acetabulum to form the vas deferens, which immediately enters the cirrus pouch that contains the vesicula seminalis, pars prostatica, and protrusible ejaculatory duct. Cirrus pouch elongated and slightly bent, about 1.8 to 2 millimeters long by 0.3 to 0.4 in maximum width; it leads directly to the genital opening which is a little posterior to the bifurcation of the intestinal cæca, in median line.

Ovary slightly smaller than testes, oval in outline, at times distinctly lobulated with three or four lobes; situated posterior to acetabulum, to left or right of median line (sexual amphitypy), but always on the same side as the cirrus sac. Receptaculum seminis oval or rounded, on dorsomesial side of ovary; Laurer's canal long but small in diameter; shell gland diffuse. Uterine coils so closely packed that their distribution into ascending and descending portions is not evident; anteriorly the continuation of the ascending branch passes dorsad to acetabulum, beyond which it forms more loops before joining the narrow vagina, which opens with the ejaculatory duct to the common genital pore. Vitellaria, composed of fairly large follicles, occupy middle third of body, between lateral excretory vessels and uterine coils, from level of middle of testis to about 4 or 5 millimeters from posterior tip of body; vitelline reservoir very small or lacking.

Excretory pore terminal, at posterior end of body; a narrow duct leads from it anteriorly, and this soon becomes enlarged into an excretory bladder which is dorsad to and hidden by the uterine coils. The formation and distribution of the principal excretory vessels similar to those in other members of the genus.

Eggs dark brown, oval, operculated, 0.043 to 0.055 millimeter long by 0.029 to 0.03 in maximum width.

TROGLOTREMIDÆ

Genus **PARAGONIMUS** Braun, 1899

Paragonimus westermanni (Kerbert, 1878).

Host: Domestic cat.

Location: Lungs.

Locality collected: Manila.

The first and only report of this parasite in a Philippine cat was made in 1907 by Musgrave.(16) In man it has been found several times.

PARAMPHISTOMIDÆ

PARAMPHISTOMINÆ

Genus **PARAMPHISTOMUM** (Fischoeder, 1901)

Paramphistomum cervi (Zeder, 1790).

Hosts: Cattle and carabao.
Location: Rumen.
Localities collected: Manila and Laguna.

Paramphistomum anisocotylea Faust, 1920.(8)

Host: Carabao.
Location: Rumen?
Locality collected: Manila.
I have not seen this parasite.

Genus **COTYLOPHORON** Stiles and Goldberger, 1910

Cotylophoron cotylophorum (Fischoeder, 1901).

Hosts: Cattle and carabao.
Location: Rumen.
Locality collected: Manila.

GASTROTHYLACIDÆ

Genus **CARMYERIUS** Stiles and Goldberger, 1910

Carmyerius gregarius (Looss, 1896).

Hosts: Cattle and carabao.
Location: Rumen and reticulum.
Localities collected: Laguna and Manila.

Genus **FISCHOEDERIUS** Stiles and Goldberger, 1910

Fischoederius elongatus (Poirier, 1883).

Host: Carabao.
Location: Rumen.

GASTRODISCIDÆ

Genus **HOMOLOGASTER** Poirier, 1883

Homologaster poloniae Poirier, 1883.

Host: *Bos* (*taurus*?).
Location: Cæcum.
Locality collected: Manila.

This fluke was reported from the Philippines by Stiles and Goldberger in 1908(24) under the name *Homologaster philip-*

pinensis. According to Maplestone,(15) it is identical to *H. poloniae.*

CESTODA

DIPHYLLOBOTHRIIDÆ

Genus **DIPHYLLOBOTHRIUM** Cobbold, 1858

Diphyllobothrium sp.

Hosts: Dog and cat.
Location: Small intestine.
Locality collected: Manila.

A specific diagnosis cannot be made of this parasite owing to failure to find the head in any of the specimens at hand.

ANOPLOCEPHALIDÆ

ANOPLOCEPHALINÆ

Genus **ANOPLOCEPHALA** E. Blanchard, 1848

Anoplocephala perfoliata (Goeze, 1782).

Host: Horse.
Location: Ileum, cæcum, and colon.

Anoplocephala mamillana (Mehlis, 1831).

Host: Horse.
Location: Small intestine.

These two species of the genus *Anoplocephala* have already been reported by Schwartz.(20) *Anoplocephala perfoliata* is very common in native horses; *A. mamillana,* on the other hand, seems very rare, for I have failed to find it in twenty-one horses that I have examined.

Genus **MONIEZIA** R. Blanchard, 1891

Moniezia expansa (Rudolphi, 1810).

Host: Cattle.
Location: Small intestine.
Locality collected: Mindanao.

Moniezia trigonophora Stiles and Hassall, 1893.

Host: Sheep.
Location: Small intestine?
Locality collected: Manila.

These two species of the genus *Moniezia* have already been reported by Schwartz.(20)

DIPYLIDIIDÆ

DIPYLIDIINÆ

Genus **DIPYLIDIUM** Leuckart, 1863

Dipylidium caninum (Linnæus, 1758).

Hosts: Dog and cat.
Location: Small intestine.

Dipylidium sexcoronatum von Ratz, 1900.

Hosts: Dog and cat.
Location: Small intestine.

This parasite is here reported for the first time from the Philippines and this is also the first record of its occurrence in the cat.

Dipylidium oerleyi von Ratz, 1900.

Hosts: Dog and cat.
Location: Small intestine.
Localities collected: Manila and Los Baños.

This species seems fairly common in Philippine dogs and cats, but this is the first record from the Islands. It is here reported for the first time in the dog.

Dipylidium buencaminoi sp. nov. Plate 1, figs. 2, 3, and 4.

Host: Dog.
Location: Small intestine.
Locality collected: Manila.

This is more closely allied to *Dipylidium oerleyi* than to any other member of the genus. The following characteristics, however, will serve to differentiate it from the latter: The smallness and the shape of its segments; the shape of the head, which is separated from the rest of the body by a comparatively long neck; its short, pyriform cirrus pouch, which does not cross internally beyond the longitudinal excretory vessel; and the large vitellaria which are composed of very minute follicles.

Specific diagnosis.—Entire worm not over 30 millimeters in length. Head (Plate 1, fig. 2) 0.45 millimeter long by 0.23 broad, vase-shaped, and provided with four rounded suckers. Rostellum (Plate 1, fig. 4) conical, about 0.13 millimeter in length by 0.05 in maximum width when fully extended; except at the tip, its anterior half is covered with four or five alternating circlets of rosethorn-shaped hooks; first two or three rows of hooks of about equal size, 0.007 millimeter long; last row of hooks smaller. Head separated from strobila by a long, slender neck, 0.45 to 0.7 millimeter long by 0.09 wide. First proglottides as wide as neck and 0.12 millimeter long; mature segments (Plate 1, fig. 3) 1.6 to 2.3 millimeters in length by 0.5 to 0.75 in maximum width; gravid segments 2.5 to 3 by 0.8 to 0.9. Genital pores not prominent, located at middle of lateral margins of segments or a little posterior of this level. Longitudinal excretory vessels coiled in appearance.

Testes (Plate 1, fig. 3) in mature segments number from 150 to 180 and occupy most of the space between the longitudinal excretory vessels not occupied by the other genitalia. They are crowded so closely together that they press against one another. Vas deferens loosely coiled, extending posteriorly and laterally toward cirrus pouch. Cirrus pouch pyriform, extending transversely from longitudinal excretory canal to genital pore.

Ovaries (Plate 1, fig. 3) bilobed, inner lobe larger than outer, each lobe made up of distinct lobules. Shell gland very small; vitellaria almost as large as ovaries, composed of very minute follicles. In gravid segments, uterine sacs contain from three to twelve eggs, about 0.008 millimeter in diameter.

I take pleasure in naming this parasite for Dr. Victor Buencamino, first Filipino veterinarian, whose success has stimulated other young Filipinos to study veterinary medicine.

Dipylidium halli sp. nov. Plate 1, figs. 5 and 6; Plate 2, fig. 1.

Host: Cat.

Location: Small intestine.

Locality collected: Manila.

This species bears some resemblance to *Dipylidium sexcoronatum* von Ratz, but is distinguished from the latter by the presence of eight alternating circlets of hooks on the rostellum and by the possession of a very elongated cirrus pouch.

Specific diagnosis.—Head (Plate 1, fig. 5) globular, about 0.25 millimeter long by 0.33 wide; suckers prominent. Rostellum (Plate 1, fig. 6) short, 0.083 millimeter by 0.07; except at tip, the entire surface is covered with eight alternating rows of rosethorn-shaped hooks, giving it the appearance of a pineapple fruit. Neck very short or absent. Most anterior segments 0.038 millimeter long by 0.227 wide; mature segments, 1.3 to 2 by 0.8 to 1; gravid segments, 2.5 to 3 by 1. Longitudinal excretory canals straight in contour. Genital pores moderately prominent, located a little posterior of middle of lateral margins of segments; occasionally they are at junction of middle and posterior thirds of lateral margins of segments.

Testes (Plate 2, fig. 1) in mature segments 100 to 140 in number, sparsely scattered in the parenchyma. Vas deferens coiled, running anteriorly and laterally from immediately in front of corresponding ovary to cirrus pouch. Cirrus pouch much elongated and bent slightly, almost one-third of its length extending inwardly across longitudinal excretory canal.

Ovaries (Plate 2, fig. 1) distinctly bilobed, inner lobe slightly larger than outer, each lobe composed of prominent lobules. Vitellaria distinct, composed of coarse follicles, a short distance posterior of ovaries. Eggs lie in groups of from five to seven within the egg capsules; they are about 0.025 millimeter in diameter.

This species is dedicated to Dr. Maurice C. Hall, of the United States Bureau of Animal Industry, Washington, D. C., in recognition of his work on anthelminthics.

TAENIIDÆ

TAENIINÆ

Genus **TAENIA** Linnæus, 1758

Taenia taeniaformis (Batsch, 1786).

Host: Cat.

Location: Small intestine.

The larval form, *Cysticercus fasciolaris* Rudolphi, of this tapeworm is frequently seen in the liver of field and house rats, white rats, and mice, in Los Baños.

Genus **ECHINOCOCCUS** Rudolphi, 1801

Echinococcus granulosus (Batsch, 1786).

Host: Dog.

Location: Small intestine?

Locality collected: Manila?

This parasite is listed under catalogue No. 150 of the United States Naval Medical School helminthological collection. It was received from the Bureau of Science, according to Garrison.

What is apparently the larval form of this tapeworm has been seen on two occasions in the heart of cattle killed at Los Baños, which cases have been reported by Schwartz.(20) According to Wharton(26) cases of echinococcus disease in man have been found in the Philippines.

OTHER LARVAL CESTODES

Cysticercus cellulosae (Gmelin, 1790).

Host: Pig.
Location: Muscles.
Localities collected: Manila, Laguna, and Pampanga.

This is the larval stage of *Taenia solium* Linnæus of man. *Cysticercus bovis,* the larval stage of *Taenia saginata,* also of man, has so far not been found in native cattle. Its occurrence is suspected by Schwartz and Tubangui,(22) because of the frequent finding of the adult form in Filipinos.

Cysticercus tenuicollis Rudolphi, 1810.

Host: Pig.
Location: Mesentery.
Locality collected: Pampanga.

The adult form of this bladder worm, *Taenia hydatigena* Pallas of the dog, has never been reported from the Philippines.

NEMATHELMINTHES

NEMATODA

KATHLANIDÆ

Genus **PROBSTMAYRIA** Ransom, 1907

Probstmayria vivipara (Probstmayr, 1865).

Host: Horse.
Location: Large intestine.

The systematic position of this nematode is not well established. Baylis(2) is of the opinion that it is related to members of the family Kathlanidæ.

FILARIIDÆ

FILARIINÆ

Genus **DIROFILARIA** Railliet and Henry, 1911

Dirofilaria immitis (Leidy, 1856).

Host: Dog.
Location: Heart and pulmonary artery.
Localities collected: Manila and Laguna.

Genus **SETARIA** Viborg, 1795

Setaria equina (Abildgaard, 1789).
Host: Horse.
Location: Abdominal cavity and cæcum.

Setaria labiato-papillosa (Alessandrini, 1838).
Host: Cattle.
Location: Abdominal cavity and rumen.

SPIRURIDÆ

SPIRURINÆ

Genus **HABRONEMA** Diesing, 1861

Habronema muscae (Carter, 1861).
Host: Horse.
Location: Stomach.

Habronema microstoma (Schneider, 1866).
Host: Horse.
Location: Stomach.

Habronema megastoma (Rudolphi, 1819).
Host: Horse.
Location: Stomach.

Genus **SPIROCERCA** Railliet and Henry, 1911

Spirocerca sanguinolenta (Rudolphi, 1819).
Host: Dog.
Location: Œsophagus, trachea, and aorta.

ARDUENNINÆ

Genus **ARDUENNA** Railliet and Henry, 1911

Arduenna strongylina (Rudolphi, 1819).
Host: Pig.
Location: Stomach.

Genus **PHYSOCEPHALUS** Diesing, 1861

Physocephalus sexalatus (Molin, 1860).
Host: Pig.
Location: Stomach.

PHYSALOPTERIDÆ

Genus **PHYSALOPTERA** Rudolphi, 1819

Physaloptera pacitae sp. nov. Plate 2, figs. 2, 3, 4, and 5.

Host: Cat.

Location: Stomach (encysted in the wall).

Locality collected: Los Baños, Laguna, Luzon.

This species differs from *Physaloptera rara* Hall, 1918,(12) of the dog in the appearance of the œsophagus and in the large size of the external teeth of the lips. It is distinguished from *Physaloptera gemina* von Linstow, 1899, of the Egyptian cat in the arrangement of the labial lips and in the number and arrangement of the caudal papillæ of the male.

Specific diagnosis.—Anterior end of body slightly attenuated in both sexes; posterior end conical. Cuticle strongly annulated. Head (Plate 2, fig. 2) marked off by a sort of collar of cuticular structure, which is continued posteriorly in the form of a sheath in which the body is completely inclosed. Mouth with two lateral lips, each presenting three small internal teeth and a large external tooth (Plate 2, fig. 3). Two submedian papillæ near base of each lip. Length of œsophagus about one-fourth that of body; it consists of two distinct portions: a slender anterior part, 0.6 to 0.8 millimeter long, and a thick posterior part, 3.8 to 4 in length. Nerve ring located on slender portion of œsophagus near its junction with the posterior part. Cervical papillæ not very conspicuous, about 1.2 millimeters from anterior end of worm.

Length of male, 19 to 22 millimeters; maximum width, 1.5. Caudal wings (Plate 2, fig. 4) prominent, supported by four pairs of pedunculated papillæ, two of which are preanal and the other two postanal. Behind the anus there are three pairs of sessile papillæ, and immediately in front there is a large unpaired papilla. Spicules dissimilar: right spicule shorter but slightly thicker, about 0.68 millimeter in length by 0.053 in maximum width; left spicule 0.91 in length by 0.038 in maximum width. Circumanal spines prominent, extending anteriorly near anterior end of left spicule.

Female, 23 to 25 millimeters long. Anus about 0.3 to 0.4 millimeter from posterior end of body. Vulva inconspicuous, opposite posterior end of œsophagus on ventral surface. Eggs thick-shelled, 0.048 to 0.05 millimeter long by 0.03 wide.

GNATHOSTOMIDÆ

GNATHOSTOMINÆ

Genus **GNATHOSTOMA** Owen, 1836

Gnathostoma spinigerum Owen, 1836.

Hosts: Dog and cat.

Location: Stomach.

According to Baylis (1) this species is identical to the *Gnathostoma siamense* of man.

Gnathostoma doloresi sp. nov. Plate 2, fig. 6; Plate 3, figs. 1, 2, 3, 4, and 5.

Host: Pig.

Location: Stomach (head buried in gastric wall).

Locality collected: Los Baños, Laguna Province, Luzon.

This species is very similar in external morphology to *Gnathostoma hispidum* Fedtchenko, but it differs from the latter in the size and appearance of its eggs, which are provided with a polar cap at each end.

Unfortunately, the male of this parasite has not yet been seen. The following description is based on only four mature female specimens:

Specific diagnosis.—Length (female), 30 to 41 millimeters; maximum width, 3.14 to 3.37. In preserved specimens, anterior third of body very much thinner than posterior two-thirds (Plate 2, fig. 6). Head bulb (Plate 3, fig. 2) 0.4 to 0.46 millimeter in length by 0.74 to 0.85 in width, covered with ten rows of singly pointed hooks (Plate 3, figs. 1 and 3). Mouth (Plate 3, fig. 1) with two lateral trilobed lips, each of which bears two submedian papillæ near the base. Œsophagus 6 to 7 millimeters long; nerve ring 0.75 millimeter from anterior end of body; cervical papillæ short, stumpy, opposite nerve ring. Cervical sacs about 2 millimeters long.

Entire surface of body covered with spines (Plate 2, fig. 6); most anterior spines comblike with six or seven subequal points (Plate 3, fig. 3); succeeding spines, to about 9 to 11 millimeters from anterior end of body, 3- to 4-pointed, the middle point longest; rest of body spines simple but long, those near tail much thinner than those placed more anteriorly. Tail rounded, with two terminal papillæ (Plate 3, fig. 4). Vulva behind middle of body. Eggs (Plate 3, fig. 5) with a wart-like process at each end, 0.06 to 0.063 millimeter long by 0.037 wide; eggshell thick, with very fine granulations on surface.

ASCARIDÆ

ASCARINÆ

Genus **ASCARIS** (Linnæus, 1758)

Ascaris lumbricoides Linnæus, 1758.
Host: Pig.
Location: Small intestine.

Ascaris equorum Goeze, 1782.
Host: Horse.
Location: Small intestine.

Ascaris vitulorum Goeze, 1782.
Hosts: Cattle and carabao.
Location: Small intestine.

Genus **BELASCARIS** Leiper, 1907

Belascaris cati Schrank, 1788.
Host: Cat.
Location: Small intestine.

Belascaris marginata (Rudolphi, 1802).
Host: Dog.
Location: Small intestine.

Genus **TOXASCARIS** Leiper, 1907

Toxascaris canis (Werner, 1782).
Host: Dog.
Location: Small intestine.

OXYURIDÆ

Genus **OXYURIS** (Rudolphi, 1803)

Oxyuris equi (Schrank, 1788).
Host: Horse.
Location: Large intestine.

Schwartz(21) has made observations on the life history of this parasite.

TRICHINELLIDÆ

TRICHURINÆ

Genus **TRICHURIS** Roederer, 1761

Trichuris suis (Schrank, 1788).
Host: Pig.
Location: Large intestine.

Trichuris ovis (Abildgaard, 1795).
Hosts: Cattle, sheep, and goat.
Location: Large intestine.

Trichuris depressiuscula (Rudolphi, 1809).
Host: Dog.
Location: Cæcum.

STRONGYLIDÆ

STRONGYLINÆ

Genus **STRONGYLUS** (Goeze, 1782)

Strongylus equinus (Mueller, 1780).
Host: Horse.
Location: Large intestine.

In the horse this is supposed to be the largest species of the genus *Strongylus;* but, as shown in fig. 1, the species occurring in the Philippine horse is distinctly smaller than *Strongylus edentatus* Looss. The males are 22 to 24 millimeters long; the females, 27 to 30.

Strongylus edentatus (Looss, 1900).
Host: Horse.
Location: Large intestine.

Strongylus vulgaris (Looss, 1900).
Host: Horse.
Location: Large intestine.

Genus **OESOPHAGODONTUS** Railliet and Henry, 1902

Oesophagodontus robustus (Giles, 1892).
Host: Horse.
Location: Large intestine.

Genus TRIODONTOPHORUS Looss, 1902

Triodontophorus intermedius Sweet, 1909.
Host: Horse.
Location: Large intestine.

Genus POTERIOSTOMUM Quiel, 1909 (18)

Poteriostomum imparidentatum Quiel, 1919.
Host: Horse.
Location: Large intestine.

Genus GYALOCEPHALUS Looss, 1900

Gyalocephalus capitatus Looss, 1900.
Host: Horse.
Location: Large intestine.

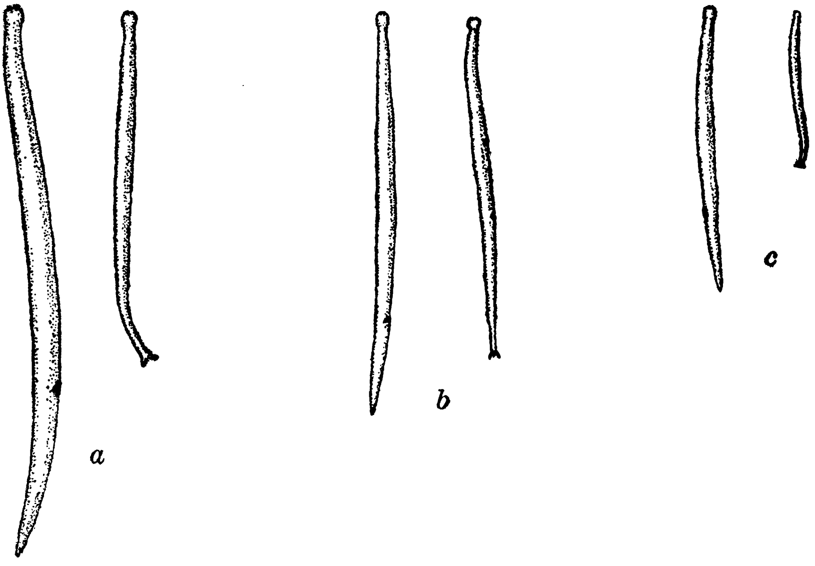

FIG. 1. *a, Strongylus edentatus; b, S. equinus; c, S. vulgaris.*

Genus CYLICOSTOMUM Railliet and Henry, 1902

The following species of the genus are all found in the large intestine of the horse:

Cylicostomum labiatum (Looss, 1901).
Cylicostomum catinatum (Looss, 1900).

Cylicostomum pseudocatinatum Yorke and Macfie,[1] 1919.(29)
Cylicostomum goldi Boulenger, 1917.(3)
Cylicostomum elongatum (Looss, 1900).
Cylicostomum insigne Boulenger, 1917.
Cylicostomum auriculatum (Looss, 1900).
Cylicostomum nassatum var. *parvum* Yorke and Macfie, 1918.(28)
Cylicostomum longibursatum Yorke and Macfie, 1918.
Cylicostomum minutum Yorke and Macfie, 1918.

METASTRONGYLINÆ

Genus **METASTRONGYLUS** Molin, 1861

Metastrongylus elongatus (Dujardin, 1845).

Host: Pig.
Location: Bronchi and bronchioles.

I have already called attention to the occurrence of this parasite in a former paper.(25)

TRICHOSTRONGYLINÆ

Genus **HAEMONCHUS** Cobb, 1898

Haemonchus contortus (Rudolphi, 1803).

Hosts: Cattle, sheep, and goat.
Location: Fourth stomach (abomasum).

ANCYLOSTOMINÆ

Group ANCYLOSTOMEÆ

Genus **ANCYLOSTOMA** Dubini, 1843, emend. Looss, 1905

Ancylostoma caninum Ercolani, 1859.

Hosts: Dog and cat.
Location: Small intestine.

Ancylostoma braziliense Gomez de Faria, 1910.

Hosts: Dog and cat.
Location: Small intestine.

This hookworm is of especial interest, as it also infests man. It was first reported from the Philippines by Darling in 1923.(7) It has been frequently found in house cats in Los Baños.

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[1] Ihle(14) considers that this species is only a variety of *Cylicostomum catinatum.*

Genus GLOBOCEPHALUS Molin, 1861

Globocephalus longemucronatus Molin, 1861. Fig. 2.

Host: Pig.

Location: Small intestine.

The identity of this parasite is not definitely established. Some writers think that it is a distinct species; others believe that it is identical either with *Crassisoma urosubulatum* Alessandrini, 1909, or with *C. samoense* Lane, 1922. As a result, even the generic name has become involved.

In a recent paper Cameron,(6) though doubting Molin's description and figures, has adopted the generic name *Globocephalus* and has retained *G. longemucronatus* as a separate species—

> * * * until a re-examination of Molin's species, should such exist, finally settles the question. Should these not exist, and should subsequent work on pigs not reveal a species with a globular mouth capsule without teeth, the question will require re-investigation.

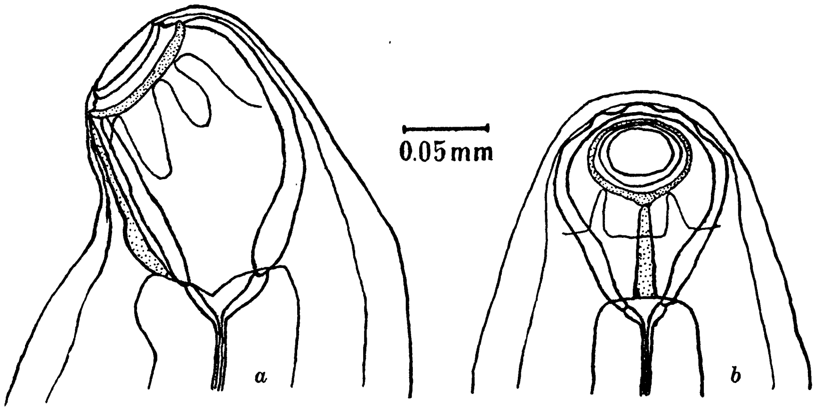

FIG. 2. *Globocephalus longemucronatus*, head; *a*, lateral view (female); *b*, dorsal view (male).

The present report is timely. The specimens at my disposal answer essentially the description given by Cameron for *Globocephalus urosubulatus* except that the mouth capsule is not provided with any vestige of teeth (fig. 2). This finding justifies the existence of the genus *Globocephalus*. One difficulty, however, is encountered: the mouth capsule of Molin's type species is said to be globular, whereas that of the Philippine parasite is cylindrical. Possibly we may have to do here with a different species, but for the present I propose to call the parasite of the Philippine pig *Globocephalus longemucronatus.*

Group OESOPHAGOSTOMEÆ

Genus **OESOPHAGOSTOMUM** Molin, 1861

Oesophagostomum columbianum Curtice, 1890.
Hosts: Cattle, sheep, and goat.
Location: Large intestine.

Oesophagostomum venulosum (Rudolphi, 1809).
Host: Goat.
Location: Large intestine.

Oesophagostomum radiatum (Rudolphi, 1803).
Host: Goat.
Location: Large intestine.

Oesophagostomum dentatum (Rudolphi, 1803).
Host: Pig.
Location: Large intestine.

Group BUNOSTOMEÆ

Genus **BUNOSTOMUM** Railliet, 1902

Bunostomum trigonocephalum (Rudolphi, 1808).
Hosts: Sheep and goat.
Location: Small intestine.

Bunostomum phlebotomum (Railliet, 1900).
Hosts: Sheep and goat.
Location: Small intestine; also abomasum, according to Boynton and Wharton.(5)

Group SYNGAMEÆ

Genus **SYNGAMUS** von Siebold, 1836

Syngamus laryngeus Railliet, 1899.
Host: Cattle.
Location: Larynx.

The occurrence of this parasite in the Philippines was first recorded by Hall in 1915.(11)

SYSTEMATIC POSITION UNCERTAIN

Genus STEPHANURUS Diesing, 1839

Stephanurus dentatus Diesing, 1839.

Host: Pig.

Location: Perirenal fat, renal pelvis, and liver.

This parasite is commonly known as the kidney worm of swine and is often responsible for the high rate of mortality among pigs in the Philippines. Its presence here was apparently first recorded by Boynton in 1914.(4) According to Gonzalez and Lago(10) and Newcomb,(17) about 50 per cent of the native pigs are infested with it. It seems, however, to be more pathogenic to the better breeds of imported swine.

LIST OF HOSTS AND THEIR PARASITES

HORSE (EQUUS CABALLUS)

Parasite.	Location.
Anoplocephala mamillana	Small intestine.
Anoplocephala perfoliata	Ileum, cæcum, and colon.
Probstmayria vivipara	Large intestine.
Setaria equina	Abdominal cavity and cæcum.
Habronema muscae	Stomach.
Habronema microstoma	Do.
Habronema megastoma	Do.
Ascaris equorum	Small intestine.
Oxyuris equi	Large intestine.
Strongylus equinus	Do.
Strongylus edentatus	Do.
Strongylus vulgaris	Do.
Oesophagodontus robustus	Do.
Triodontophorus intermedius	Do.
Poteriostomum imparidentatum	Do.
Gyalocephalus capitatus	Do.
Cylicostomum labiatum	Do.
Cylicostomum catinatum	Do.
Cylicostomum pseudocatinatum	Do.
Cylicostomum goldi	Do.
Cylicostomum elongatum	Do.
Cylicostomum insigne	Do.
Cylicostomum auriculatum	Do.
Cylicostomum nassatum var. *parvum*	Do.
Cylicostomum longibursatum	Do.
Cylicostomum minutum	Do.

CATTLE (BOS TAURUS)

Parasite.	Location.
Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Fasciolopsis sp.	Intestine?
Dicrocoelium lanceatum	Bile ducts?
Paramphistomum cervi	Rumen.
Cotylophoron cotylophorum	Do.
Carmyerius gregarius	Rumen and reticulum.
Homologaster poloniae	Cæcum.
Moniezia expansa	Small intestine?
Echinococcus granulosus (larva)	Heart.
Setaria labiato-papillosa	Abdominal cavity and rumen.
Ascaris vitulorum	Small intestine.
Trichuris ovis	Large intestine.
Haemonchus contortus	Abomasum.
Oesophagostomum columbianum	Large intestine.
Syngamus laryngeus	Larynx.

CARABAO (BUBALUS BUBALUS)

Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Paramphistomum cervi	Rumen.
Cotylophoron cotylophorum	Do.
Carmyerius gregarius	Rumen and reticulum.
Fischoederius elongatus	Rumen.
Ascaris vitulorum	Small intestine.
Paramphistomum anisocotylea	Rumen?

SHEEP (OVIS ARIES)

Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Eurytrema ovis	Fat surrounding rectum.
Moniezia trigonophora	Small intestine?
Trichuris ovis	Large intestine.
Haemonchus contortus	Abomasum.
Oesophagostomum columbianum	Large intestine.
Bunostomum trigonocephalum	Small intestine.
Bunostomum phlebotomum	Do.

GOAT (CAPRA HIRCUS)

Fasciola hepatica	Bile ducts.
Fasciola gigantica	Do.
Trichuris ovis	Large intestine.
Haemonchus contortus	Abomasum.
Oesophagostomum columbianum	Large intestine.
Oesophagostomum venulosum	Do.
Oesophagostomum radiatum	Do.
Bunostomum trigonocephalum	Small intestine.
Bunotomum phlebotomum	Small intestine and abomasum.

PIG (SUS SCROFA DOMESTICUS)

Parasite.	Location.
Cysticercus cellulosae	Muscles.
Cysticercus tenuicollis	Mesentery.
Arduenna strongylina	Stomach.
Physocephalus sexalatus	Do.
Gnathostoma doloresi	Do.
Ascaris lumbricoides	Small intestine.
Trichuris suis	Large intestine.
Metastrongylus elongatus	Bronchi and bronchioles.
Globocephalus longemucronatus	Small intestine.
Oesophagostomum dentatum	Large intestine.
Stephanurus dentatus	Perirenal fat, renal pelvis, and liver.

DOG (CANIS FAMILIARIS)

Parasite.	Location.
Diphyllobothrium sp.	Small intestine.
Dipylidium caninum	Do.
Dipylidium sexcoronatum	Do.
Dipylidium oerleyi	Do.
Dipylidium buencaminoi	Do.
Echinococcus granulosus	Do.
Dirofilaria immitis	Heart and pulmonary artery.
Spirocerca sanguinolenta	Œsophagus, trachea, and aorta.
Gnathostoma spinigerum	Stomach.
Belascaris marginata	Small intestine.
Toxascaris canis	Do.
Trichuris depressiuscula	Large intestine.
Ancylostoma caninum	Small intestine.
Ancylostoma braziliense	Do.

CAT (FELIS CATUS)

Parasite.	Location.
Opisthorchis felineus?	Bile ducts.
Opisthorchis wardi	Do.
Paragonimus westermanni	Lungs.
Diphyllobothrium sp.	Small intestine.
Dipylidium caninum	Do.
Dipylidium sexcoronatum	Do.
Dipylidium oerleyi	Do.
Dipylidium halli	Do.
Taenia taeniaformis	Do.
Physaloptera pacitae	Stomach.
Gnathostoma spinigerum	Do.
Belascaris cati	Small intestine.
Ancylostoma caninum	Do.
Ancylostoma braziliense	Do.

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ILLUSTRATIONS

ABBREVIATIONS

acet, acetabulum.
an, anal opening.
bal, balonet.
bsp, body spines.
cp, cervical papilla.
cs, cervical sac.
cirsp, circumanal spines.
cirs, cirrus sac.
ep, excretory pore.
es, œsophagus.
exbl, excretory bladder.
exv, excretory vessel.
et, external tooth.
gp, genital pore.
hh, head hooks.
int, intestinal branch.
it, internal teeth.
lc, Laurer's canal.
ll, lobes of lips.
nr, nerve ring.
os, oral sucker.
ov, ovary.
pap, submedian papillæ.
ph, pharynx.
rsem, receptaculum seminis.
sespap, sessile papilla.
t, testis.
ut, uterine coils.
vef, vas efferens.
vit, vitellaria.

PLATE 1

FIG. 1. *Eurytrema ovis* sp. nov.
2. *Dipylidium buencaminoi* sp. nov., head and part of neck.
3. *Dipylidium buencaminoi* sp. nov., rostellum.
4. *Dipylidium buencaminoi* sp. nov., mature segment.
5. *Dipylidium halli* sp. nov., head.
6. *Dipylidium halli* sp. nov., rostellum.

PLATE 2

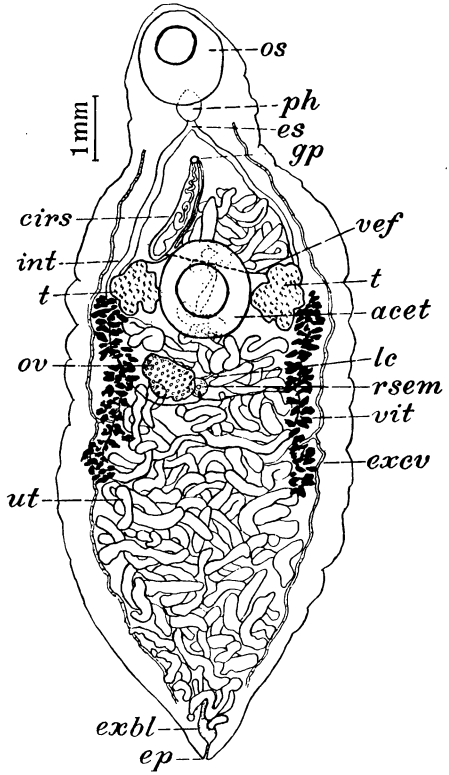
FIG. 1. *Dipylidium halli* sp. nov., mature segment.
2. *Physaloptera pacitae* sp. nov., anterior end of body, ventral view.
3. *Physaloptera pacitae* sp. nov., head, anterior view.
4. *Physaloptera pacitae* sp. nov., posterior end of male, ventral view.
5. *Physaloptera pacitae* sp. nov., eggs.
6. *Gnathostoma doloresi* sp. nov., female, × 3.

PLATE 3

FIG. 1. *Gnathostoma doloresi* sp. nov., anterior end, ventrofrontal view.
2. *Gnathostoma doloresi* sp. nov., anterior end, ventral view.
3. *Gnathostoma doloresi* sp. nov.; *a,* head hooks; *b, c, d,* body spines.
4. *Gnathostoma doloresi* sp. nov., posterior end of female, ventral view.
5. *Gnathostoma doloresi* sp. nov., eggs.

TEXT FIGURES

FIG. 1. *a, Strongylus edentatus* (Looss); *b, S. equinus* (Mueller); *c, S. vulgaris* (Looss).
2. *Globocephalus longemucronatus* Molin, head; *a,* lateral view (female); *b,* dorsal view (male).



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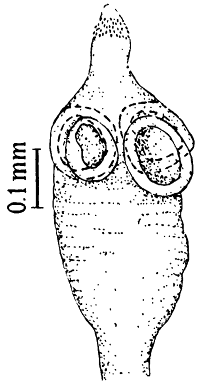

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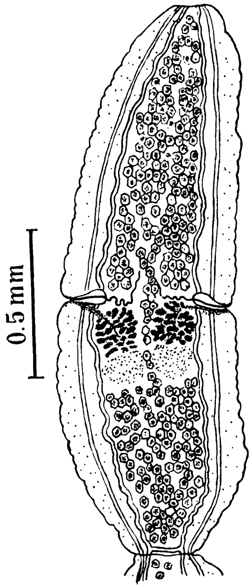

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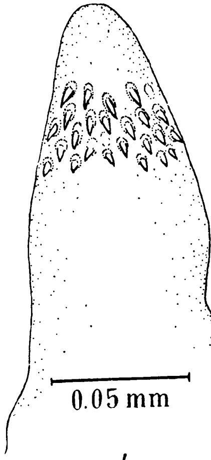

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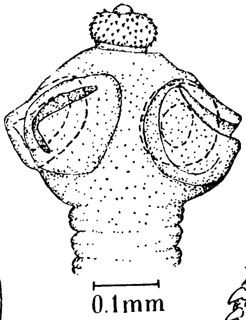

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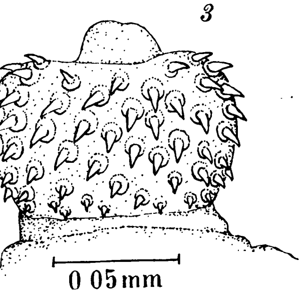

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PLATE 1.

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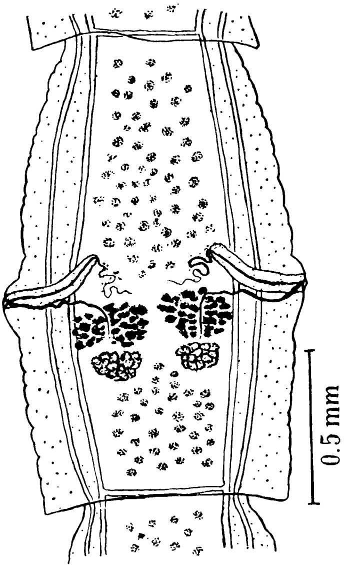

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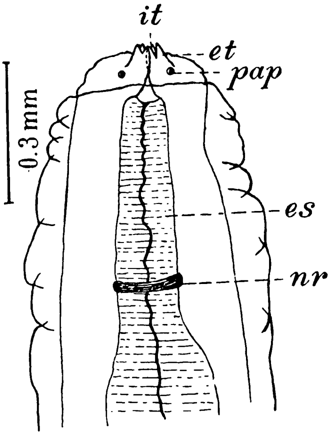

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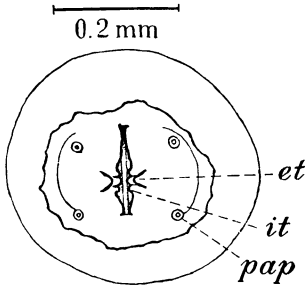

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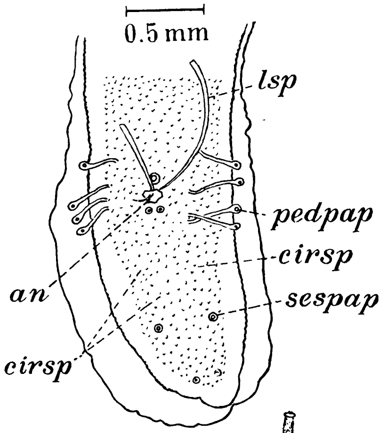

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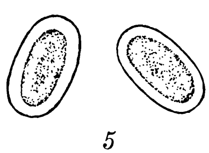

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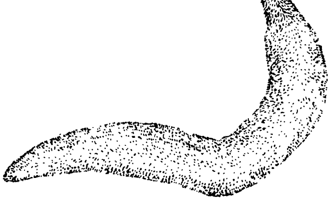

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PLATE 2.

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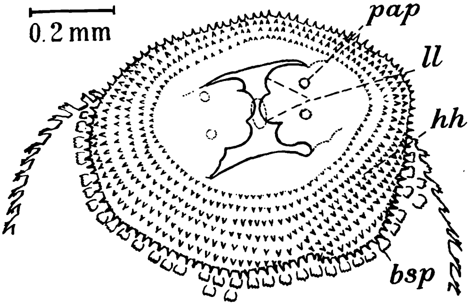

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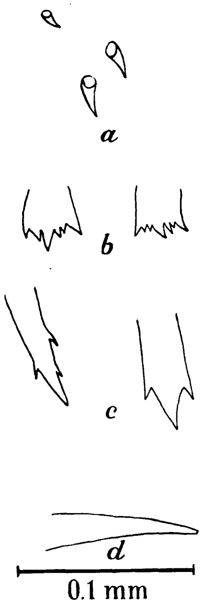

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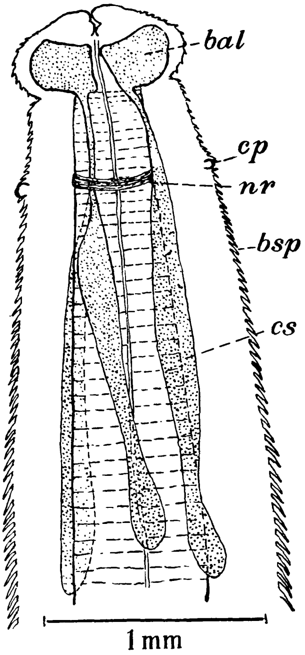

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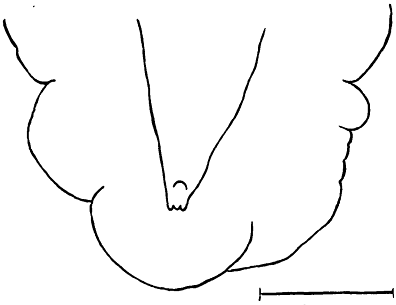

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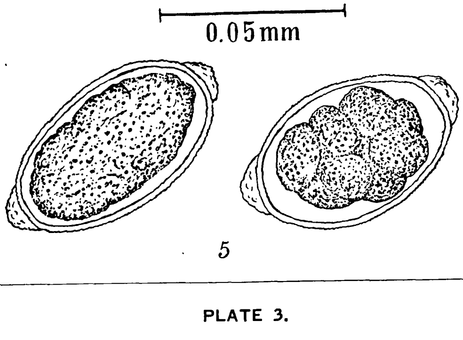

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PLATE 3.

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NOTES ON PSYLLIDÆ

By D. L. Crawford

Of the University of Hawaii, Honolulu

ONE TEXT FIGURE

In the examination of specimens of Psyllidæ from the Philippine Islands and other Pacific regions, several new species have appeared, and these are used as the basis for the following notes:

Genus **STENOPSYLLA** Kuwayama

This is a specialized genus of Triozinæ, and is characterized conspicuously by the very thick and densely pubescent antennæ. Two very closely similar species have been known in this genus, *S. nigricornis* Kuwayama[1] and *S. longicornis* Crawford,[2] and now a third species appears, similar in most respects but very strikingly different in wing venation. In spite of this difference, however, it appears to be congeneric with the two species mentioned above.

Key to the species of Stenopsylla Kuwayama.

a^1. Venation of forewing triozine (that is, basal vein branching at one point into three veins, cubitus, media, and radius).
  b^1. Body yellowish or light brown, dorsum flecked with brown; genal cones acutely pointed; antennæ half as long as forewings; insect about 5 to 6 millimeters long. (Formosa.) **S. nigricornis** Kuwayama.
  b^2. Body light brown, mesothoracic dorsum and vertex black or dark brown; genal cones broadly rounded at apex; antennæ three-fourths as long as forewings; insect 6 to 7 millimeters long. (Philippines.) **S. longicornis** Crawford.
a^2. Venation of forewing not as above; cubitus branching off first, then media and radial sector more distad (see fig. 1). **S. bakeri** sp. nov.

Stenopsylla bakeri sp. nov. Fig. 1.

A large species, body from head to tip of folded wings being about 8 millimeters long; forewings, 6 to 6.5. General color light yellowish brown; dorsulum and eyes black, vertex brown and antennæ brown to black, except apical one-fifth white.

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[1] Trans. Sapporo Nat. Hist. Soc. 3 (1910) 53.

[2] Philip. Journ. Sci. 15 (1919) 203.

Head broad, vertex very concave, posterior ocelli elevated; genal cones about half as long as vertex, very broad and bluntly rounded. Antennæ long, nearly as long as forewings (about 5 millimeters), thick (nearly as thick as legs), very densely pubescent.

Thorax long, not very broad, pronotum short and much depressed below level of head and dorsulum. Legs stout, hind tibiæ armed with black spines apically. Forewings very large, hyaline and transparent except a narrow black stripe along axial vein, acutely pointed; venation as shown in fig. 1; hind wings about half as long as front wings.

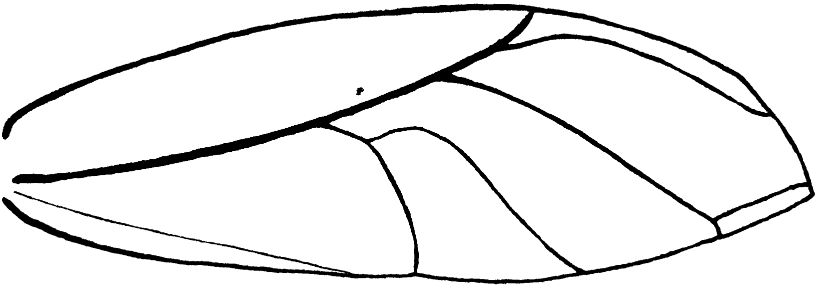

FIG. 1. *Stenopsylla bakeri* sp. nov., venation of forewing.

Abdomen (female) long, moderately slender, with genital segment relatively very short and blunt.

Locality, Philippines, Mindanao, Iligan (*C. F. Baker*), 1 female.

Euphalerus nigrivittatus Crawford **pubescens** var. nov.

A single specimen of this species, taken by C. F. Baker on Basilan Island, Philippines, shows a number of superficial variations worthy of note. The black vittæ from eyes to base of wings are wanting, the thorax and vertex being more or less uniformly straw color or whitish; the antennæ are uniformly straw color, not black at tip of each segment as is usually the case in the species. The clear spots in the apical brown band of the forewing are larger and more conspicuous, being circular instead of crescentic.

The genal cones are not squarish as in the species, but bluntly rounded and divergent. On the dorsum of thorax as well as on the vertex there is a conspicuous though not dense pubescence.

Genus STROPHINGIA Enderlein

(Including *Haplaphalara* Uichanco)

This genus is very close to *Aphalaroida* and might conceivably be merged with it. In the matter of priority, *Aphalaroida* was described one month before the other [3] and so would have the right of priority. However, there appear to be several distinctive characteristics separating the two genera, making it advisable to consider both as valid groups of the subfamily Aphalarini.

The genus *Strophingia* was erected for an old species, *Rhinocola ericae* Curtis, and doubtless will have a considerable number of old and new species added to it in due time. The type species of *Rhinocola* is *R. aceris* Linnæus, which is very different [4] in several respects from most of the other species subsequently referred to that genus. Some of these probably will go to *Eurhinocola* Crawford,[5] but some, also, should be referred to Enderlein's *Strophingia.*

Strophingia differs from *Aphalaroida* chiefly in the texture of the forewings. *Strophingia* has semitransparent wings, whereas the forewings of *Aphalaroida* are thick and opaque. *Aphalaroida,* furthermore, has a conspicuous and distinctive clothing of thick, glandular hairs on the body surface and sometimes on the wing surface as well, whereas the other genus lacks this characteristic entirely.

Haplaphalara Uichanco [6] was erected in 1921 for a previously known species of *Aphalara* (*Aphalara dahli* Rübsaamen), which is not congeneric with other species of that genus. However, between this species and those referred to *Strophingia* there are no real generic differences, and therefore I propose that *Haplaphalara* be considered a synonym of *Strophingia.*

Description.—Usually very small insects, body about 1 to 2 millimeters long; head small; vertex flat, about half as long as wide, with front ocellus on its anterior margin. Frons a small sclerite beneath vertex, visible from in front or in ventral aspect, bearing the front ocellus at its anterior end; genæ slightly swollen beneath vertex, but not produced in conical processes or lobes.

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[3] *Aphalaroida,* U. S. Nat. Mus. Bull. 85 (June 3, 1914) 38.

[4] *Strophingia,* Ent. Mitt. 3 (July 1, 1914); see U. S. Nat. Mus. Bull. 85 (1914) 24.

[5] Rec. Ind. Mus. 7 (1912) 422.

[6] Philip. Journ. Sci. 18 (1921) 260.

Antennæ short, usually about as long as width of vertex (between eyes), but sometimes as long as width of head including eyes, or longer. Eyes hemispherical.

Forewings usually semihyaline or hyaline (not thick and opaque), broadly rounded; pterostigma usually present, either closed or open; membrane often maculated or colored.

Type of genus, *S. ericae* (*Rhinocola ericae* Curtis).

In addition to the type species, the following three species should be referred to this genus:

Rhinocola targioni Licht., Verh. Zool. Bot. Ges. Wien 38: 12.

Paurocephala orientalis Crawford, Philip. Journ. Sci. 10 (1915) 261. Locality, Philippine Islands.

Aphalara (*Haplaphalara*) *dahli* Rübsaamen, Marcellia 4 (1905) 22; Philip. Journ. Sci. 18 (1921) 260. Localities, Bismarck Archipelago and Philippine Islands.

Spanioneura arcuata Crawford.

Katacephala arcuata CRAWFORD, Bull. U. S. Nat. Mus. 85 (1914) 115.

This species appears to be more closely allied to the old genus *Spanioneura* than to *Katacephala,* since the latter has broad, rhomboidal wings.

Locality, Mexico.

Spanioneura conigera Crawford.

Paurocephala conigera CRAWFORD, Philip. Journ. Sci. 15 (1919) 151.

This species was referred to *Paurocephala* with some doubt as to its proper relations. It appears to be closely related to species of *Spanioneura.*

Locality, Moluccas, Amboina.

Spanioneura quadrimaculata sp. nov.

Very similar to *S. conigera* Crawford, differing most strikingly in the presence of four conspicuous, square, black spots on vertex, two on each side of front ocellus.

Head flexed sharply downward into a vertical position; vertex large, about twice as broad as long, slightly convex. Genal cones large, broad, nearly contiguous on inner margin, subacutely pointed. Antennæ twice as long as width of head, very slender.

Forewings semitransparent (slightly thickened or coriaceous), with a tinge of brown at apex; venation similar to that of *S. conigera.*

Locality, Philippines, Mindanao, Dapitan (*Baker*), 1 specimen.

ILLUSTRATION

TEXT FIG. 1. *Stenopsylla bakeri* sp. nov., venation of forewing.

A NEW SPECIES OF SAMBUS FROM MANILA (COLEOPTERA; BUPRESTIDÆ)

By W. S. FISHER

Of the Bureau of Entomology, United States Department of Agriculture

Sambus atropurpureus sp. nov.

Rather robust and moderately convex; above black, with a slight purplish tinge, the head slightly rubineous in front, and the elytra marked with transverse zigzag bands of silvery white pubescence; beneath black, with a feeble æneous reflection, and rather densely clothed with short white pubescence.

Head broadly grooved, the groove becoming deeper on vertex and occiput and causing two more or less distinct gibbosities on vertex, and two similar ones on the front, the surface densely, finely granulose, obsoletely reticulate, and sparsely clothed with rather short recumbent silvery white hairs, with a few dark inconspicuous hairs on the elevated areas; antennæ black, with a feeble æneous or purplish tinge on the basal joints, not quite extending to middle of pronotum, and serrate from the fifth joint; clypeal suture distinct and strongly elevated; epistoma rather wide, transverse between the antennæ, and deeply depressed.

Pronotum twice as wide as long, slightly narrower in front than behind, and widest at middle; sides flattened and regularly arcuate, with the lateral margins finely crenulate and the posterior angles broadly rounded; anterior margin feebly bisinuate, without a distinct median lobe; base deeply arcuately emarginate at the elytral lobes, with a broadly rounded median lobe, which is subtruncate in front of scutellum; lateral carina strongly arcuate, and extending from base to apical third, but not touching lateral margin; disk strongly convex anteriorly and limited at basal fourth by a broadly rounded transverse depression; surface rather densely punctate and coarsely reticulate, the reticulation more or less concentrical on the disk, and sparsely clothed with short silvery white and inconspicuous black hairs intermixed. Scutellum large, purplish black, triangular, strongly acuminate posteriorly, and the surface densely finely reticulate.

Elytra at base about equal in width to the pronotum at middle, rather convex, with shallow basal depressions, and a similar one along the lateral margins behind the humeri; sides parallel along basal fourth, feebly arcuately constricted in front of the middle, arcuately expanded at apical third, then arcuately attenuate to the tips, which are broadly conjointly rounded, finely serrate, and not entirely concealing the abdomen; surface rather coarsely, densely imbricate, rather densely clothed with short inconspicuous dark hairs of the same color as the surface, and ornamented with broader silvery white hairs as follows: A rather inconspicuous series of transverse zigzag bands on basal half, and a very distinct double row of similar bands at apical third.

Abdomen finely and densely reticulate, the last segment deeply arcuately grooved along the apical margin, and the area in front of the groove broadly, but not deeply arcuately emarginate.

Length, 4.75 millimeters; width, 2.

Type, catalogue No. 27299, United States National Museum.

Described from a single example collected by R. C. McGregor, at Manila, Luzon, during April, 1924.

This species is closely allied to *Sambus lugubris* Saunders and *Sambus aeneicollis* Fisher, but differs from both in being of a purplish black color above. From the former it also differs in having the head more gibbose on the front, sides of pronotum not as broadly flattened, and the elytral markings composed entirely of silvery white pubescence. From *aeneicollis* it can be distinguished also by its being more robust. It also resembles *Sambus nigricans* Fisher, but in that species the head is not gibbose or as deeply grooved, the pronotum is more regularly convex, and the elytra have a single transverse zigzag pubescent band at apical third, behind which is a broad transverse band of the same color.

THE ANTS OF THE PHILIPPINE ISLANDS

PART I, DORYLINÆ AND PONERINÆ

By WILLIAM MORTON WHEELER
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and
JAS. W. CHAPMAN[1]
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TWO PLATES

FORMICIDÆ

Subfamily DORYLINÆ Leach

Tribe ECTONINI FOREL

Genus AENICTUS Shuckard

Aenictus laeviceps F. Smith.

Typhlatta leviceps F. SMITH, Journ. Linn. Soc. London Zool. 2 (1857) 79.

Type locality: BORNEO, Sarawak (*A. R. Wallace*).

LUZON, Laguna Province, Los Baños (*F. X. Williams*), 18 workers.

Aenictus aratus Forel.

Aenictus aratus FOREL, Ann. Soc. Ent. Belg. 44 (1900) 74.

Type locality: Australia; Queensland, Makay.

LUZON (*Williams*), 1 specimen.

This specimen from Luzon agrees perfectly with Forel's description and with a specimen of *A. aratus* in the senior author's collection bearing Forel's label.

Aenictus martini Forel.

Aenictus martini FOREL, Journ. Bombay Nat. Hist. Soc. 13 (1901) 464 and 473.

Type locality: Malacca; Pahang (*R. Martin*).

LUZON, Laguna Province, Los Baños (*Williams*), 8 workers; Mount Maquiling (*3083 C. F. Baker*), 1 worker. NEGROS,

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[1] Collaborator, United States Bureau of Entomology.

Oriental Negros Province, Dumaguete, Horns of Negros (*J. W. Chapman*).

Twenty workers were taken from a foray, Horns of Negros, December 25, 1918, at 450 meters altitude. They were passing over bushes with no definite regularity and were moving quite rapidly. They could not be found a few hours later. Repeated search for them has been made but they have not been seen since, which seems to indicate that they migrate long distances. Specimens from Dumaguete seem to be a little lighter in color than those taken by Williams in Luzon.

Aenictus luzoni sp. nov. Plate 1, figs. 1 and 2.

Worker.—Length, 4.5 millimeters. Head rectangular, one and one-half times as long as broad; sides moderately rounded; occipital corners and occipital border rounded. Antennal hollows deep and moderately far apart. Scape of antennæ barely extending to corners of head; joints of flagellum longer than broad. Anterior margin of clypeus rounded. Mandibles triangular, broadest at their apical borders; apical tooth acute and curved; subapical tooth at apical third of mandible.

Thorax with pronotum rounded anteriorly and convex above; narrower than the head. Mesonotum somewhat compressed. Epinotum rounded above; apical part sloping. Nodes of petiole and postpetiole as broad as long, rounded above, a little distance apart. Abdomen large and oval; basal segment petiolate anteriorly.

Smooth and shining. Mandibles finely striated. Mesopleura with a few nearly obsolete longitudinal striæ, some of which extend on to the base of epinotum.

Body covered with sparse, recumbent yellow hairs, more abundant on antennæ and apical joints of legs.

Reddish brown; darker on vertex. Lateral spots on head yellow, and not placed as high on the sides as in *A. martini.*

LUZON, Ilocos Norte Province, Bangui (*C. S. Banks*), 8 workers.

Aenictus camposi sp. nov. Plate 1, figs. 3 and 4.

Worker.—Length, 2.5 millimeters. Head rectangular, almost one and one-half times as long as broad; sides slightly curved; occipital corners and borders rounded. Antennal scape scarcely reaching beyond corners of head. Joints of flagellum longer than broad; first and second twice as long as broad, subequal.

Antennal furrows shallow and approximate. Anterior margin of clypeus convex. Mandibles with finely denticulate borders; apical tooth acute and curved.

Pronotum narrower than head, convex above; mesonotum compressed. Basal portion of epinotum long; apical part short, declivity vertical, margined on its lateral borders. First petiolar node fully twice as long as broad; postpetiolar node slightly shorter and well separated from first. Gaster small and oval; legs long and slender, very little incrassate.

Smooth and shining. Mesonotum and base of epinotum finely rugose, subopaque. Abdomen shining and almost translucent.

Covered with sparse recumbent yellow hairs, more abundant on antennæ and legs.

Yellowish; nodes of petiole and postpetiole, apex of gaster, and undersides of antennæ lighter yellow. Head without lateral spots.

Resembles *A. wroughtoni* Forel, but is easily distinguished by the rugose epinotum, the color, and the slighter femora. A remnant of a male shows filiform antennæ, with the second joint of the flagellum longer than the scape. The male *A. wroughtoni* has the scape spatulate.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 1,200 meters altitude (*Chapman*).

A nest of this ant was found beneath the bark of a fallen dead tree by the junior author and one of his students during May, 1918. No sex forms were taken at that time. Unfortunately the vial which contained them was broken during the day and only a few individuals were saved. This log was examined in 1919 and again in 1921, but no trace of them was found. During May, 1922, a large colony consisting of 80 workers, 50 larvæ, 200 pupae, and the broken remains of one male were found.

This species is dedicated to Juan D. Campos, who was with the junior author during 1918 when the species was first found.

Aenictus sp.

Males of seven species of *Aenictus* have been taken at lights by various collectors in the Islands.

LUZON, Laguna Province, Mount Maquiling (*Williams*), two species; (*Baker*), one species; (from Staudinger and Bang-Haas), one species: Mountain Province, Baguio (*Williams and Chapman*), one species: Bataan Province, Limay (from Staudinger and Bang-Haas). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters (*Chapman*).

Males have been frequently taken at light at 450 meters altitude, which shows that there are several other species of *Aenictus* in the Islands, the workers of which have not been seen.

Description of these males will be reserved till further collections are made.

Subfamily CERAPACHYINÆ Forel

Tribe CERAPACHYINI Forel

Genus **CERAPACHYS** F. Smith

Cerapachys rufithorax sp. nov. Plate 1, figs. 5, 6, and 7.

Worker.—Length, 3.75 millimeters. Head rectangular, one-fifth longer than broad, with moderately rounded sides, nearly rectangular occipital corners, and straight occipital border. Eyes large, slightly curved; situated a distance equal to their longest diameter from anterior lateral angles of head. Antennal scape club-shaped, extending barely to posterior border of eyes. First flagellar joint as long as broad; 2 to 11 transverse. Apical joint as long as the preceding eight and two and one-half times as long as broad. Frontal carinæ short and separated by about the width of the basal part of scape. Carinæ of cheeks smooth. Anterior border of clypeus convex. Mandibles triangular and apical border finely dentate.

Thorax twice as long as broad, sides straight, anterior border rounded, feebly margined, in profile convex above. Epinotal declivity sloping, concave, with the smallest trace of margination on its lateral borders, but none above. Petiolar node subquadrate, truncated anteriorly, marginate about the truncated portion, rounded transversely above; ventral tooth triangular and situated well forward. Postpetiole similar to petiole, but a third broader and higher. Remainder of gaster twice as long as broad.

Shining; mandibles and scape finely punctate and shining. Head and gaster covered with scattered foveolate punctures, nearly obsolete on thorax, which is smoother. Epinotal declivity smooth and shining. Petiolar node and postpetiole finely rugose, subopaque; shining in certain lights. Anterior surface of legs minutely punctured, posterior surface smooth.

Covered with long, dense, recumbent grayish hairs; very dense on petiole and postpetiole, partially hiding the sculpture.

Pleuræ of epinotum, anterior face of petiole, postpetiole, antennal clubs, and apical joints of legs covered with dense stiff hairs.

Red. Head and gaster reddish brown. Thorax, petiole, and postpetiole lighter. Club of antennæ and tarsi reddish yellow.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

A nest of more than 40 workers, including larvæ, eggs, and a few pupæ, was found beneath the sheath of a leaf of *Palma brava.*

Cerapachys negrosensis sp. nov. Plate 1, fig. 8.

Worker.—Length, 3 millimeters. Head rectangular, one-fifth longer than broad, sides feebly rounded, occipital corners rounded with occipital border straight. Eyes moderate in size and placed a distance equal to their longest diameter from base of mandibles. Antennal scapes at their apical end more than twice as thick as first funicular joint. Club as long as preceding five joints and as broad as apical portion of scape. Antennal carinæ short, approximate. Anterior margin of clypeus nearly straight.

Thorax very little convex, rounded transversely, without margination. Base of epinotum rounded into apical portion, not margined at lateral angles or above. Node of petiole cuboidal, as high as base of epinotum, truncated anteriorly, with trace of margination, postpetiole as broad as long, gaster ovate.

Mandibles shining; head, thorax, and apical part of gaster sparsely covered with foveolate punctures, less noticeable on thorax, which is rugose and subopaque, like the node of petiole and postpetiole. Mandibles and scape covered with sparse piligerous punctures.

Entirely covered with recumbent white hairs, more noticeably on petiole and postpetiole; dense, short, stiff hairs on antennæ and legs.

Red. Head and apical segments of gaster reddish brown. Thorax, petiole, postpetiole, and appendages paler. Club of antennæ and tarsi still paler.

Resembles the preceding species, but is very much smaller in every respect. The thorax is less convex in profile and more rugose. The declivity of the epinotum is not margined either laterally or above.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 700 meters altitude (*Chapman*), 1 worker.

Cerapachys nitida sp. nov. Plate 1, figs. 9 and 10.

Worker.—Length, 3.5 millimeters. Head rectangular, one and one-fourth times as long as broad, posterior angles feebly rounded, occipital border straight. Eyes medium, convex, their longest diameter equal to the breadth of apical portion of scapes; about in the middle line of head. Antennal scapes stout, barely reaching to posterior orbits of eyes. Antennal club as long as the preceding seven joints. Frontal carinæ separated from each other by the width of the base of scape. Anterior margin of clypeus almost straight. Mandibles slight, apical border bearing minute teeth.

Thorax rectangular, sides straight, one and one-half times as long as broad, anterior angles rounded. In profile straight and somewhat flat. Epinotal declivity oblique, concave, not margined laterally or above. Node of petiole a little longer than broad, including the ventral spine as high as long. Postpetiole subquadrate, basal segment of gaster longer than broad.

Shining; head, mandibles, scape, thorax, postpetiole, and gaster covered with fine piligerous punctures, more obsolete on pleura of thorax and partly covered by the pilosity of gaster. Node of petiole delicately rugose and subopaque.

Body covered with recumbent gray hairs; short, stiff, and more abundant on antennal club, tarsi, lateral pleuræ of epinotum, and node.

Red. Node of petiole reddish yellow. Club of antennæ and tarsi yellow.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), 6 workers nesting under the bark of a fallen dead tree.

Cerapachys muiri sp. nov. Plate 1, figs. 11 and 12.

Worker.—Length, 4.5 millimeters. Head one and one-fourth times as long as broad, slightly broader behind than in front. Eyes moderately convex, their distance from anterior lateral angles of head equal to their longest diameter. Antennal scapes stout, clublike, extending to posterior orbits of eyes. Segments 2 to 11 of flagellum transverse, club two and one-half times as long as broad. Mandibles stout, apical border broad, toothed. Anterior margin of clypeus slightly convex, carinæ of cheeks crenulate.

Thorax twice as long as broad, in profile convex. Base of epinotum rounding into apical portion. Space of declivity marginate at lateral borders but not above. Node of petiole as long as broad, truncated in front, marginate, rounded anteriorly and posteriorly. Postpetiole as broad as long, basal segment of gaster twice as long as postpetiole.

Shining; head and abdomen covered with piligerous punctures which are coarser on petiole, postpetiole, and posterior angles of epinotum. Epinotal declivity smooth.

Completely covered with sparse, recumbent gray hairs, more abundant on petiole, postpetiole, gaster, antennæ, and legs. Antennal club covered with a short gray pile.

Deep red. Antennal club reddish yellow.

LUZON, Laguna Province, Los Baños (*F. Muir*), 1 worker.

Genus **LIOPONERA** Mayr

Lioponera luzuriagæ sp. nov. Plate 1, figs. 13 and 14.

Worker.—Length, 3.5 millimeters. Head rectangular, about one and one-fourth times as long as broad, sides feebly curved, occipital border straight. Antennal scapes club-shaped, barely reaching middle transverse line of head. Antennal carinæ short, space between them equal to the width of scape at its base. Flagellar joints 2 to 6 transverse. Eyes large, their diameter little less than one-third length of head, placed well forward on sides of head, less than half their diameter from its anterior angles. Anterior margin of clypeus feebly curved. Mandibles triangular, apical borders minutely dentate.

Thorax rectangular, more than twice as long as broad, front rounded, epinotal declivity oblique. Node of petiole nearly as long as broad, very little convex above and truncated in front, transverse behind. Postpetiole as long as basal segment of gaster and one-third longer than broad.

Subopaque; shining in certain lights. Thorax and abdomen covered with fine, delicate, foveolate, piligerous punctures, more abundant on front of head. Space between eyes at anterior third smooth. Mandibles and scape feebly punctured.

Dense recumbent white pile, hiding the sculpture in large part, covers the body, more abundant on legs, antennæ, sides of head, and abdomen.

Reddish brown; head, anterior border of pronotum, antennæ, and legs lighter.

Female.—Length, 3.5 millimeters; dealated. Similar to the worker. Head almost one-third longer than broad. Thorax one and one-half times as long as broad, sides very little rounded. Epinotal declivity oblique; gaster long and slender.

NEGROS, Oriental Negros Province, Luzuriaga, Horns of Negros, 450 meters altitude (*Chapman*), 16 workers and 1 female.

Lioponera bicolor sp. nov. Plate 1, figs. 15 and 16.

Worker.—Length, 2.7 millimeters. Head rectangular, a little longer than broad, sides feebly curved, occipital border straight. Eyes large, slightly convex, placed just back of the base of mandibles. Antennal scapes extend to middle line of head. Mandibles triangular, apical borders broad, finely dentate. Anterior margin of clypeus transverse.

Thorax rectangular, twice as long as broad, in profile very little curved. Epinotal declivity oblique, concave. Node of petiole broader than long, emarginate anteriorly and concave. Basal segment of abdomen twice the length and height of node.

Smooth and shining. Head smooth, with minute scattered punctures. Thorax and node shining. Basal segment of gaster subopaque, remainder of gaster smooth.

Covered with fine recumbent yellow hairs, more abundant on legs and gaster.

Yellow; head and apical segments of abdomen black. Mandibles, antennæ, thorax, node, and apical segment of abdomen yellowish.

Resembles *L. parva* Forel, but the head and the abdomen are black.

Female.—Length, 3.5 millimeters. With the exception of the sexual characters and size, the female resembles the worker in all respects.

Male.—Length, 3.5 millimeters. Head including eyes broader than long, convex and somewhat constricted behind; without posterior corners; cheeks very short; eyes large, two-thirds as long as head, very convex; ocelli large; mandibles long, narrow, with relatively broad mascatory margin, with apical tooth acute. Clypeus large, anterior border rounded. Antennal carinæ short, moderately far apart; scape long but not reaching posterior border of eyes; funicular joints 8 to 11 distinctly longer than broad.

Thorax robust, broadest anterior to wings, convex above; scutellum convex, broader than long. Base of epinotum somewhat truncated, equal in length to apical portion.

Petiole as broad as long, rounded above, with anterior-ventral spine prominent. Gaster long.

Smooth and shining. Pilosity similar to that of the worker. Color uniformly brownish throughout.

LUZON, Laguna Province, Los Baños (*Williams*), several workers, males, and females.

Lioponera bakeri sp. nov. Plate 1, fig. 17.

Worker.—Length, 4 millimeters. Head longer than broad, broader behind than in front, occipital border straight. Eyes moderately convex, placed at the sides of head, well toward the front. Antennal scapes club-shaped, reaching to posterior occipital border. Antennal carinæ short, distance between them equal to diameter of scape at its apex. Anterior margin of clypeus concave; mandibles triangular, apical borders toothed.

Thorax in profile moderately convex. Epinotal declivity oblique. Node of petiole as long as high, from above square, truncated in front, transversely rounded above. Basal segment of gaster separated from the rest of the gaster by a deep constriction. Gaster comparatively long.

Densely punctured. Head coarsely rugose, finer on the remainder of the body. Covered with fine recumbent pile. Hairs suberect, scattered, more abundant on scape and abdomen.

Brownish black throughout. Undersides of flagellum and distal ends of femora reddish brown.

BASILAN (*Baker*), 1 worker.

Subfamily PONERINÆ Lepeletier

Tribe AMBLYOPONINI Forel

Genus **MYSTRIUM** Roger

Mystrium camillæ Emery.

Mystrium camillae EMERY, Ann. Mus. Stor. Nat. Genova **10** (1889) 491, figs. 1–3.

Type locality: Birmania.

LUZON, Laguna Province, Los Baños (*Williams*), 8 workers.

Genus **STIGMATOMMA** Roger

Stigmatomma rothneyi Forel.

Stigmatomma rothneyi FOREL, Journ. Bombay Nat. Hist. Soc. Zool. 13 (1900) 55–56.

Type locality: India (*Rothney*).

LUZON, Laguna Province, Los Baños and Mount Maquiling (*Wiliams*), 37 individuals including males, females, and workers.

Stigmatomma (Fulakora) luzonicum sp. nov. Plate 1, fig. 18.

Female.—Length, 3.5 millimeters. Head in front as broad as long, broader in front than behind, trapezoidal, sides nearly straight, occipital border transverse, frontal groove feeble. Eyes small, placed on the sides at posterior one-third of head. Antennal carinæ approximate, diverging behind. Scapes short, barely reaching to eyes. Joints of flagellum, excepting 1 and 11, transverse. Anterior margin of clypeus convex and armed with six bifid teeth. Mandibles two-thirds as long as head, thickened basal portion with six teeth, the most apical trifid.

Thorax rectangular, twice as long as broad. Basal portion of epinotum rounding into apical portion, lateral angles of which are margined, the disk thus formed concave. Node cuboidal, frontal surface rectangularly truncated, with anterior lateral angles slightly rounded, ventral protuberance small. Abdomen as long as thorax. Legs rather long and femora slightly thickened.

Subopaque. Head punctate-rugose, thorax and abdomen shining. Declivity of epinotum smooth. Covered with a fine gray pile. Hairs gray, erect, scattered; more abundant on antennæ, legs, and gaster.

Reddish brown. Occiput black; mandibles, clypeus, antennæ, legs, and apical segments of abdomen reddish yellow.

LUZON, Laguna Province, Los Baños (*Baker*), 1 dealated female.

Stigmatomma (Fulakora) williamsi sp. nov. Plate 1, fig. 19.

Worker.—Length, 5.5 millimeters. Head moderately convex above, rounded on sides, broader in front than behind, with posterior lateral angles rounded, occipital border straight. Anterior lateral angles of head behind base of mandibles provided with a tooth. Eyes minute, placed at sides on upper half of head. Midway of the longitudinal suture on the front is a pit that resembles an ocellus. Antennal carinæ close together. Joints of flagellum distinct, first and eleventh longer than broad. Anterior margin of clypeus convex, provided with a single row of teeth, the most apical four teeth bifid. Apical tooth acute and curved.

Thorax twice as long as broad, promesonotal suture deep, mesoepinotal suture not prominent, declivity of epinotum oblique, basal and apical portions continuous through a gradual curve, apical surface of epinotum broadened with marginate sides. Node of petiole from above slightly longer than broad, truncated anteriorly, rounded above and on sides; truncated surface slightly concave, much narrower below. Gaster large, very long, basal segment one-third as long as the remainder.

Rugose. Head and dorsal part of thorax and abdomen finely and closely punctured. Mandibles striated at base, with smooth apex. Pleuræ finely and vertically striated. Node and gaster shining.

Covered with sparse erect gray hairs, more abundant on antennæ and abdomen. Fine gray pile covers all parts of body.

Reddish brown. Antennæ, legs, and apical segments of gaster yellowish.

Female.—Length, 6 millimeters; dealated. Very similar to worker, with the usual sexual modifications. Teeth on clypeus crowded together and the number not distinct; bifid as in the worker. Pronotum narrower in front. Pilosity and color as in the worker.

LUZON, Mountain Province, Baguio, 1,370 meters altitude (*Williams*), 13 workers and 2 females.

Genus **MYOPOPONE** Roger

Myopopone castanea Smith subsp. **maculata Roger.**

Myopopone maculata ROGER, Berl. Ent. Zeitschr. 5 (1861) 50. Type locality, Ceylon.

Myopopone castanea Smith subsp. *maculata* WHEELER, Bull. Mus. Comp. Zool. 43, No. 3 (1919) 50. Type locality, Ceylon.

LUZON, Laguna Province, Los Baños (*Williams; Baker*), workers and females; Mount Maquiling (*3286, 9183, 3285 Baker*), females. MINDANAO, Dapitan (*12133 Baker*), female: Lanao, 1 female from Staudinger and Bang-Haas. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

One female taken at light. A female and ten workers nesting beneath the ground in a dead stump. The workers vary in length from 7.5 to 10 millimeters.

Myopopone castanea Smith var. **bakeri** Viehmeyer.

Myopopone castanea Smith var. *bakeri* VIEHMEYER, Ent. Mitteil. 5 (1916) 283. Type locality, Leyte, Tacloban (*3285 Baker*).

One worker with the above number and locality was received from the Bureau of Science, Manila. The number corresponds with that of a female of *M. castanea* subsp. *maculata*. A further study of the material from Leyte may show that this is merely one of the small workers of the preceding subspecies.

Tribe PLATYTHYREINI Emery

Genus **PLATYTHYREA** Roger

Platythyrea inermis Forel.

Platythyrea inermis FOREL, Philip. Journ. Sci. § D 5 (1910) 122. Type locality, Luzon, Montalban Gorge (*C. S. Banks*).

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros (*Chapman*).

A nest was found in the trunk of a dead tree fern. Also a few individuals on the ground near by. The collection consists of males, workers, and pupæ.

Platythyrea coxalis Emery.

Platythyrea coxalis EMERY, Rev. Suiss. Zool. (1893) 189, nota. Type locality, Malucca, Perak.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Nineteen individuals, one of which was a male, were nesting on the ground in a hollow dead branch.

Platythyrea coxalis Emery var. **philippinensis** Viehmeyer.

Platythyrea coxalis var. *philippinensis* VIEHMEYER, Ent. Mitteil. 5 (1916) 283. Type locality, Luzon, Los Baños (*1234 Baker*).

LUZON, Laguna Province, Los Baños (*Williams*), 22 workers. GUIMARAS, Bureau of Science collection, 1 worker. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), 2 females, 1 male, and 4 workers.

Platythyrea maquilingi sp. nov. Plate 2, figs. 1 and 2.

Worker.—Length, 6 millimeters. Head rectangular, sides feebly rounded, occipital border very feebly concave, much broader posteriorly than in front. Front strongly convex. Eyes small, placed at the middle transverse line of head. Scapes of antennæ reaching just beyond corner of head. Flagellar joints 6 to 10 transverse. Antennal carinæ far apart. Clypeus and front forming a strong anterior-posterior convex curve without distinct suture. Anterior margin of clypeus convex. Mandibles triangular, apical border broad and minutely denticulate throughout; apical tooth curved.

Thorax one-third as broad as long, premesonotal suture strongly marked, mesoepinotal suture obsolete. Epinotal declivity high, oblique, and concave, lateral angles smooth and rounded. Node of petiole slightly longer than broad. Anterior surface rounded, posterior surface truncated, without lobes above. Gaster large and oval. Basal segment broader than long. Posterior coxæ with blunt tooth.

Subopaque, densely and finely punctured, much obscured by fine grayish pubescence. Erect hairs scattered over head and abdomen.

Black; mandibles, antennæ, legs, and apical segments of gaster reddish brown.

Resembles *P. inermis* Forel, but is smaller and has the posterior coxæ toothed.

LUZON, Laguna Province, Mount Maquiling (*Baker*), 3 workers.

Tribe ECTATOMINI Emery

Genus **STICTOPONERA** Mayr

Stictoponera coxale Roger.

Ponera coxale ROGER, Berl. Ent. Zeitschr. 4 (1860) 308. Type locality, Ceylon (*H. Nietner*).

LUZON, Laguna Province, Paete, Sarai (*R. C. McGregor*), 1 worker; Los Baños (*Williams*), 5 workers; Mount Maquiling (*2069 Baker*), I worker. MINDANAO, Kolambugan (*Banks*), BASILAN (*12133 Baker*), 1 male. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Workers of this species were found foraging singly on plants in a cool damp ravine, near a small spring. Complete colony found May, 1924, nesting under moss on a large stone.

Stictoponera menadensis var. **bicolor** Emery.

Stictoponera menadensis subsp. *bicolor* EMERY, Ann. Mus. Stor. Nat. Genova 27 (1859) 493. Type locality, Birmania.

LUZON, Laguna Province, Mount Maquiling (*2070 Baker*), 1 male.

Genus **CHALCOPONERA** Emery

Chalcoponera victoria Ern. Andre var. **andrei** var. nov. Plate 2, figs. 3 and 4.

Worker.—Length, 4.5 millimeters. Head about as broad as long, broadest through occiput. Occipital corners feebly rounded, occipital border very little concave. Eyes large and convex, placed posterior to middle transverse line of head. Antennal carinæ far apart, borders parallel and extending about its breadth beyond corners of head. Joints of funiculi longer than broad. Joints 1 and 11 twice as long as broad. Clypeus convex longitudinally, separated from front by a feeble suture. Mandibles large, triangular, inner apical margin minutely dentate.

Prothorax not as wide as head, twice as long as broad, angulate ventrally at sides, with a distinct tooth. Promesonotal suture distinct, mesoepinotal suture faint or obsolete. Basal part of epinotum rounding into apical portion. Node from above transversely oval, rounded in front, flat behind, and as high as basal segment of gaster, produced on its anterior ventral surface into a trapezoidal spine.

Abdomen as broad as prothorax, twice as long as broad. Anterior legs with pectinate spine. Middle and posterior pair with simple spine. Claws with tooth on basal inner half.

Rugose. Mandibles smooth, obsoletely striate, and covered with punctures. Head longitudinally cribrate on clypeus and front. Antennal sulci finely striate. Sides of head and occiput strongly reticulate-cribrate. Scape finely striated. Thorax strongly rugose, declivity of epinotum transversely striated. Node of pedicel strongly rugose in front, posterior surface finely rugose. Abdominal segments 1 and 2 finely striated, the striæ diverging concentrically from mid-dorsal longitudinal line.

Covered with erect scattered hairs, more abundant on head and apical segments of abdomen.

Reddish brown. Legs lighter red. Mandibles and antennæ reddish yellow.

This genus is Australian. On examining the material in the senior author's collection we found this undescribed variety from the mountains of Victoria. Dr. F. X. Williams took one specimen at Los Baños, Luzon, Philippine Islands, that cannot be distinguished from the specimens from Victoria. It would seem probable that this species has been introduced into the Philippines on vegetation shipped from Australia to the College of Agriculture at Los Baños.

Type locality: Victoria Mountains, Australia. Several workers.

LUZON, Laguna Province, Los Baños (*Williams*), 1 worker.

Tribe PONERINI Forel

Genus **CENTROMYRMEX** Mayr

Centromyrmex feæ Emery.

Spalacomyrmex feæ EMERY, Ann. Mus. Stor. Nat. Genova 27 (1889) 491, pl. 10, figs. 11–15. Type locality, Birmania; Bhamô.

LUZON, Laguna Province, Los Baños, Mount Maquiling (*Baker*), 2 females. BASILAN (*Baker*), 1 female and 1 male.

Genus **HARPEGNATHOS** Jerdon

Harpegnathos venator Smith var. **rugosus** Mayr.

Harpegnathos venator Smith var. *rugosus* MAYR, Verh. Zool. Bot. Ges. Wien 12 (1862) 732. Type locality, Hongkong.

LUZON, Laguna Province, Mount Maquiling (*Baker*), 1 specimen.

This single specimen differs from two specimens of typical *H. venator* Smith, from Hongkong and Assam, in the senior author's collection, and from Mayr's description of the subsp. *rugosus* in the color of the node and hind legs in which the brown color is replaced by black. The sculpture is that of *rugosus*. Perhaps the Philippine specimen represents a distinct variety.

Harpegnathos macgregori sp. nov.

Worker.—Length, 20 millimeters. Head without mandibles in front as broad as long. Antennal scapes filiform, extending one-fifth their length beyond corners of head. Joints of flagellum longer than broad, subequal. Mandibles articulating with exterior angles of head, apical border very long, approximate throughout and provided with two rows of teeth which point toward base of mandibles.

Thorax long and cylindrical, promesonotal suture prominent, mesoepinotal suture obsolete. Epinotal declivity oblique, relatively short. Node of petiole two and one-fourth times as long as broad, higher behind than in front, rounded on front and sides. Basal segments of gaster about one-third the length of entire gaster.

Opaque; head, pronotum, and mesonotum coarsely, longitudinally striated. Epinotum with transverse striæ. Node rugosely punctate, gaster finely punctate, interspersed with coarser punctures.

Body covered with sparse erect pale gray hairs. Black; mandibles, legs, flagellum, and dorsal spot on first and second segments of gaster yellow.

BILIRAN (*McGregor*), 1 specimen.

Genus **ODONTOPONERA** Mayr

Odontoponera transversa Smith. Plate 2, fig. 5.

> *Ponera transversa* F. SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 63. Type locality, Singapore (*A. R. Wallace*).
>
> *Odontoponera transversa* EMERY, Ann. Soc. Ent. France (1893) 262; WHEELER, Bull. Am. Mus. Nat. Hist. 24 (1909) 339; FOREL, Philip. Journ. Sci. § D 5 (1910) 122; VIEHMEYER, Ent. Mitteil. 5 (1916) 285.

LUZON, Rizal Province, Antipolo (*E. Simon*): Laguna Province, Los Baños (*Williams; Baker*); Mount Banahao (*Williams*); Paete, Sarai (*McGregor*); Mount Maquiling (*Baker*). Bantayan (*L. E. Griffin*). ROMBLON (*H. M. Smith and L. Morato*). PANAY, Iloilo Province, Iloilo (*L. Ortaliz*): Antique Province, Tibiao (*McGregor*). BASILAN (*Baker*). JOLO (*A. C. Duyag*). NEGROS, Occidental Negros Province, Maao (*C. S. Banks*): Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

This ant is very common on the sides of the Horns of Negros from 300 to 600 meters. It lives in the ground, the entrance to the nest often unprotected, and in the barren and worn trails. It is especially fond of termites and is often seen raiding their colonies.

Odontoponera transversa Smith var. **biconcentrica** var. nov. Plate 2, fig. 6.

Worker.—Length, 12 millimeters. This variety can be distinguished from *O. transversa* Smith, the only known species of the genus, by the concentric arrangement of the striæ on the pronotum.

BASILAN (*Baker*), a single worker.

Genus **DIACAMMA** Mayr

Diacamma rugosum Le Guillou.

> *Ponera rugosa* LE GUILLOU, Ann. Soc. Ent. France 10 (1840) 318. Type locality, Borneo (Voyage of the Astrolabe and Zelee).
>
> *Ponera versicolor* F. SMITH, Cat. Hym. Insect. Brit. Mus. 6 (1858) 87 (*o. d. t. l.* Philippines).

Diacamma rugosum Le Guillou; ROGER, Berl. Ent. Zeitschr. 6 (1863) 16; ASHMEAD, Proc. U. S. Nat. Mus. 8 (1904) 153, No. 1387; WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 338.

Philippines; F. Smith.

Diacamma rugosum Le Guillou var. **sculptum** Jerdon.

Ponera sculpta JERDON, Madras Journ. Lit. Soc. 17 (1851) 117. Type locality, Ceylon.

Diacamma rugosum subsp. *sculptum* WHEELER, Bull. Ann. Mus. Nat. Hist. 26 (1909) 338.

LUZON, Manila (*W. A. Stanton*): Laguna Province, Mount Maquiling (*Williams*): Mountain Province, Baguio, 600 to 1,800 meters altitude (*Williams*); Trinidad (*H. M. Smith*). Bantayan Bay; Setanki Island; Sibutu Island (*H. M. Smith*).

Diacamma rugosum Le Guillou subsp. **sculptum** var. **vagans** Smith.

Ponera vagans F. SMITH, Journ. Proc. Linn. Soc. London Zool. 4 (1860) Suppl. 103. Type locality, Batacian Islands.

Diacamma rugosum subsp. *sculptum* var. *vagans* WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 339.

PAPAGON ISLAND, near Luzon (*H. M. Smith*). LUZON, Manila (*R. Thaxter*): Laguna Province, Los Baños (*Baker*); Calauang (*McGregor*), Bureau of Science No. 14188. NEGROS, Oriental Negros Province, Dumaguete (*Chapman*).

This species seems to vary considerably and will have to be studied more in detail in the field before we can draw final conclusions in regard to its status.

Diacamma rugosum geometricum Smith.

Ponera geometrica F. SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 67. Type locality, Singapore (*A. R. Wallace*).

Diacamma rugosum subsp. *geometricum* FOREL, Philip. Journ. Sci. § D 5 (1910) 122; WHEELER and CHAPMAN, Psyche 29 (1922) 203–211.

LUZON, Laguna Province, Paete, Sarai (*McGregor*); Los Baños (*Williams*): Cagayan Province, Port San Vicente Hills (*H. M. Smith*): Mountain Province, Mount Pulog (*H. M. Curran*), Bureau of Science No. 10280. MINDANAO, Davao Province, Davao (*Copeland*). PANAY, Iloilo Province, Iloilo (*L. Ortaliz*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros from sea level to 600 meters altitude (*Chapman*).

About fifty collections of this species were made by the junior author. During 1922 two colonies were found with males, one of which was in copulation with a worker.

Specimens of *D. geometricum* agree perfectly with those in the senior author's collection from North Borneo and Celebes, but differ from those from Hongkong and Burma in the shape of the petiole and length of the spines.

Diacamma rugosum subsp. **geometricum** var. **vidipurpureum** Emery.

Diacamma rugosum subsp. *geometricum* var. *vidipurpureum* EMERY, Ann. Soc. Ent. France (1893) 261. Type locality, Luzon, Antipolo (*E. Simon*).

Diacamma rugosum subsp. *geometricum* var. *vidipurpureum* WHEELER, Bull. Am. Mus. Nat. Hist. 26 (1909) 338; FOREL, Philip. Journ. Sci. § D 5 (1910) 122.

LUZON, Manila (Staudinger and Bang-Haas): Laguna Province, Los Baños (*Williams*); Paete, Sarai (*McGregor*); Mount Banahao (*Williams; Baker;* Staudinger and Bang-Haas): Bataan Province, Limay (*Boettcher*): Ilocos Norte Province (*Banks*): Benguet and San Vicente Hills (*H. M. Smith*). BANTAYAN ISLAND (*L. E. Griffin*). MARINDUQUE and SANTA CRUZ ISLANDS (*H. M. Smith*). MINDORO, Calapan (Staudinger and Bang-Haas). MASBATE, Port Cataingan (*H. M. Smith*). ROMBLON, Romblon (*L. Morato*). SAMAR, Basiao Island (*H. M. Smith*). PANAY, Antique Province, Tibiao and Culasi (*McGregor*). CEBU, Cebu (*Williams*). NEGROS, Oriental Negros Province, Dumaguete (*Chapman*), a colony with 16 workers, 5 pupæ, and 4 larvæ; also numerous isolated workers on other occasions.

Diacamma palawanicum Emery.

Diacamma palawanicum EMERY, Ann. Mus. Stor. Nat. Genova 40 (1900) 666. Type locality, Palawan, Philippine Islands.

Diacamma palawanicum var. **concentricum** var. nov. Plate 2, figs. 7 and 8.

Worker.—Length, 16 millimeters. Head longer than broad, broadest in front, occipital corners and border rounded. Eyes prominent, convex. Antennæ filiform, joints 2 and 3 of the funiculus subequal. Clypeus convex and almost angular at the middle anterior border.

Thorax long, slender, epinotal declivity oblique; node of pedicel higher than long, as broad as long, spines one-half as long as node is high; far apart and pointing backward and outward. Node flat anteriorly, truncated posteriorly, concavity between spines reaching one-third the distance from posterior to anterior border. Distance between spines equal to one-third the breadth of basal segment of gaster.

Head and thorax striated, gaster smooth. Mandibles striated, clypeus multicarinate or longitudinally cribrate. Occiput longitudinally striated but none of the striæ pass from occipital border forward to clypeus; all diverge to frontal carinæ.

Striæ on pronotum concentric. Epinotal declivity submarginate, striæ transverse. Node of petiole striate, striæ beginning above from base of spines of node and continuing horizontally throughout.

Covered with fine gray pile, with sparse erect gray hairs, scattered rather uniformly over body, longer and more abundant on front of head and apical segments of gaster.

Black; mandibles, antennæ, and legs reddish brown. Differs from the type in having the striæ of the pronotum arranged concentrically instead of longitudinally.

PALAWAN, Binaluan (*G. Boettcher*); Malampaya (*W. Schultze*), Bureau of Science No. 14009. Described from five workers.

Diacamma panayensis sp. nov. Plate 2, figs. 9 and 10.

Worker.—Length, 16 millimeters. Head a little longer than broad. Eyes convex, prominent, placed well back on sides of head. Antennæ filiform, funicular joints 2, 3, and 4 subequal. Anterior margins of clypeus rounded, convex; mandibles strongly toothed.

Thorax slender, base of epinotum compressed, declivity oblique and feebly concave. Node of petiole longer at base than above; as long as wide. Anterior face concave, posterior face flat, lateral corners rounded. Spines about one-fourth the height of node. Gaster large, as long as thorax and head combined.

Opaque. Mandibles striate, occiput longitudinally striate, the striæ passing from occipital border between eyes and antennal carinæ to clypeus. Pronotum transversely striated. The striæ on the node of the petiole begin independently of the spines and run more or less horizontally around the node throughout. Basal segment of abdomen smooth.

Pilosity lacking, excepting on head and apical segments of gaster. Gaster smooth and shining and covered with a fine grayish pile.

Black; mandibles, clypeus, flagellum, legs, and sting reddish brown.

This species resembles *D. palawanicum* Emery in having the basal segment of the gaster smooth, but differs from it in the transverse striæ on the pronotum and the shape of the node of the petiole.

PANAY, Antique Province, Culasi (*McGregor*), 6 workers.

Diacamma baguiensis sp. nov. Plate 2, figs. 11 and 12.

Worker.—Length, 11 millimeters. Head very slightly longer than broad, sides straight, occipital corners and border rounded. Antennæ long, filiform; funicular joints 2, 3, and 4 subequal. Median lobe of clypeus angular, its anterior margin rounded; frontal carinæ short and approximate. Mandibles stout, triangular, bearing several teeth on the apical border.

Thorax elongate, narrow, more than twice as long as broad, declivity of epinotum obliquely truncated. Node in front as high as long, one-third higher behind. Anterior face concave, posterior face broad; as broad as its greatest diameter; concave; spines short, pointing backward and inward. Abdomen long and rather massive.

Mandibles finely striated. Head and occiput longitudinally striate, all the striæ meeting the antennal carinæ posterior to middle line of head. Pronotum transversely striate. Epinotal striæ concentric with anterior part open at the mesoepinotal suture. Epinotal suture transversely striated. Striæ of node begin with spines and run horizontally throughout. Basal segment of gaster covered with prominent striæ which run very nearly transversely throughout.

Pilosity wanting, excepting a few scattered hairs on head and apical segments of gaster. Entire body covered with a pale yellowish pile.

Black; antennæ, legs, and apical segment of gaster reddish brown.

LUZON, Mountain Province, Baguio, 1,370 meters altitude (*Chapman*), 2 workers.

Genus **ECTOMYRMEX** Mayr

Ectomyrmex annamitus Ern. Andre.

Ectomyrmex annamitus ERN. ANDRE, Rev. Ent. 11 (1892) 48. Type locality, Birmania.

LUZON, Laguna Province, Mount Maquiling (*Baker*), 3 females.

Genus **BOTHROPONERA** Mayr

Bothroponera glabripes Emery.

Bothroponera glabripes EMERY, Ann. Soc. Ent. France (1893) 262; WHEELER, Bull. Am. Mus. Nat. Hist. **26** (1909) 339. Type locality, Mindanao, Philippines.

Bothroponera tridentata Smith.

Pachycondyla tridentata SMITH, Cat. Hym. Brit. **6** (1858) 106. Type locality, Borneo, Sarawak.

TAWITAWI (*A. C. Duyag*). JOLO (*Duyag*).

Several workers from the above localities measure 17 to 19 millimeters.

Bothroponera williamsi sp. nov. Plate 2, figs. 13 and 14.

Worker.—Length, 9.5 millimeters. Head as broad as long, sides feebly rounded, occipital border very slightly concave. Eyes small, situated just posterior to base of mandibles. Antennal scapes cylindrical, reaching barely to corners of head. Joints 2 to 10 of flagellum as broad as long. Anterior margin of clypeus rounded, carinate at middle line. Mandibles stout, apical border armed with seven strong teeth.

Thorax two-thirds as broad as long, broader in front than behind, promesonotal suture prominent, mesoepinotal suture obsolete. Epinotal declivity oblique, lateral borders emarginate. Node of petiole high, twice as broad as long, convex in front, posterior surface flat, above transversely rounded. Abdomen moderately large.

Opaque; mandibles striate on their outer margins and sparsely covered with foveolate punctures. Clypeus longitudinally rugose. Head and anterior part of thorax rugose. Base of epinotum cribrate, declivity transversely striate.

Covered with dense, erect, reddish yellow hairs, longest on clypeus, base of epinotum, and abdomen; sparse on antennæ and legs. A fine recumbent pile abundant on all parts of body excepting declivity of epinotum, anterior surface of gaster, and node.

Black; mandibles, clypeus, antennæ, legs, and apical segments of abdomen reddish.

LUZON, Laguna Province, Mount Maquiling (*Williams*), a single worker.

Genus **EUPONERA** Forel

Euponera (Trachymesopus) darwinii Forel var. **indica** Emery.

Euponera (Trachymesopus) darwinii Forel var. *indica* EMERY, Bull. Ent. Italy 31 (1900) 276, nota; VIEHMEYER, Ent. Mitteil. 5 (1916) 284. Type locality, Upper Burmah (*Doherty*).

LUZON, Laguna Province, Los Baños (*Baker and Williams*); Mount Maquiling (*Baker*): Ilocos Norte Province (*Banks*): Manila (*Banks*), Bureau of Science Nos. 4767, 6395, and 13258. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), males and females taken at light.

Euponera (Trachymesopus) stigma Fabr. var. **quadridentata** Smith.

Ponera quadridentata SMITH, Journ. Proc. Linn. Soc. London Zool. 3 (1858) 143. Type locality, Aru Islands.

LUZON, Laguna Province, Los Baños (*Baker and Williams*); taken by Williams in a rotten log in the forest; Mount Maquiling (*Baker*); San Antonio (*F. W. Foxworthy*), Bureau of Science No. 11481. BASILAN (*Baker*).

Euponera (Brachyponera) luteipes Mayr.

Ponera luteipes MAYR, Verh. Zool.-bot. Ges. Wien 12 (1862) 722. Type locality, Milu-Nicobar Islands (Novara Expedition).

LUZON, Rizal Province, Antipolo (*E. Simon*): Laguna Province, Los Baños (*Williams and R. Thaxter*); Mount Maquiling (*Williams*), 3 females from the summit; Mount Banahao, at 300 to 1,200 meters altitude (*Williams*). PALAWAN, Binaluan (*G. Boettcher*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 1,200 meters altitude (*Williams*).

Females taken at a light at 450 meters altitude by the junior author on a number of occasions.

Genus **PONERA** Latreille

Ponera moczaryi Emery.

Ponera moczaryi EMERY, Term. Fuzet. 23 (1900) 316–319, pl. 8, figs. 15–16. Type locality, New Guinea.

LUZON, Laguna Province, Los Baños (*Williams*), 8 workers. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros (*Chapman*), two colonies consisting of males and workers.

Ponera punctatissima Roger subsp. **schaunslandi** Emery.

Ponera punctatissima Roger subsp. *schaunslandi* EMERY, Zool. Jahrbuch Syst. 12 (1899) 239. Type locality, Island of Laysan.

LUZON, Manila (*R. Thaxter*).

Ponera confinis Roger var. **javana** Forel.

Ponera confinis Roger var. *javana* FOREL, Mitt. Nat. Mus. Hamburg 22 (1905) 6. Type locality, Buitenzorg, Java (*K. Kraepelin*).

LUZON, Laguna Province, Mount Maquiling (*Williams*), 9 specimens from the summit; Los Baños (*Williams*), several workers. NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), several colonies consisting of workers.

Ponera gleadowi Forel.

Ponera gleadowi FOREL, in Emery Mem. Accad. Soc. Bolona (5) 5, 292, nota. Type locality, India (*Wroughton*).

LUZON, Laguna Province, Los Baños (*R. Thaxter*), 5 workers.

Genus **TRAPEZIOPELTA** Mayr

Trapeziopelta breviloba Wheeler.

Trapeziopelta breviloba WHEELER, Bull. Mus. Comp. Zool. Harvard 63 (1919) 143. Type locality, Borneo, Sandakan (*Baker*).

BASILAN (*Baker*), 1 female.

Genus **LEPTOGENYS** Roger

Leptogenys (Leptogenys) maxillosa F. Smith.

Ponera maxillosa F. SMITH, Cat. Hym. Brit. Mus. 6 (1858) 93. Type locality, Maurice Islands.

PANAY, Antique Province, Culasi (*McGregor*).

Leptogenys (Leptogenys) pruinosa Forel.

Leptogenys pruinosa FOREL, Journ. Bombay Nat. Hist. Soc. 13 (1900) 304. Type locality, Ceylon (*Bingham*).

LUZON, Manila (*R. Brown*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), one worker.

Leptogenys (Lobopelta) peuqueti Andre.

Lobopelta peuqueti ANDRE, Rev. Ent. 6 (1887) 292. Type locality, Ceylon.

LUZON, Laguna Province, Los Baños (*Williams*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Leptogenys (Lobopelta) peuqueti Andre var. **watsoni** Forel.

Leptogenys (Lobopelta) peuqueti Andre var. *watsoni* FOREL, Journ. Bombay Nat. Hist. Soc. 13 (1900) 309. Type locality, N. Burmah.

LUZON, Laguna Province, Los Baños (*Baker and Williams*). PANAY, Antique Province, Tibiao (*McGregor*). NEGROS, Oriental Negros Province, Dumaguete (*Chapman*).

Leptogenys (Lobopelta) diminuta F. Smith.

Ponera diminuta F. SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 69. Type locality, Borneo, Sarawak (*A. R. Wallace*).

PAPAGON ISLAND (*H. M. Smith*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), nesting in the trunk of a dead tree fern.

Leptogenys (Lobopelta) diminuta Smith var. **opacinodis** Emery.

Leptogenys diminuta Smith var. *opacinodis* EMERY, Ann. Mus. Stor. Nat. Genova 25 (1887) 433. Type locality, Sumatra.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*), nesting in an old log.

Leptogenys (Lobopelta) chinensis Mayr.

Lobopelta chinensis MAYR, Verh. Zool.-bot. Ges. Wien 20 (1870) 265. Type locality, China.

NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 1,150 meters altitude (*Chapman*).

Foray crossing the trail. Some were carrying pupæ. The winged forms were taken at light at 450 meters altitude.

Leptogenys (Lobopelta) iridescens F. Smith.

Ponera iridescens SMITH, Journ. Proc. Linn. Soc. London Zool. 2 (1857) 6. Type locality, Borneo, Sarawak (*A. R. Wallace*).

PALAWAN, Binaluan (*Boettcher*).

Workers agree well with Smith's description.

Leptogenys (Lobopelta) punctiventris Mayr.

Lobopelta punctiventris MAYR, Verh. Zool.-bot. Ges. Wien (1878) 665. Type locality, Sillim.

LUZON, Laguna Province, Los Baños (*Williams*). NEGROS, Oriental Negros Province, Dumaguete and on the Horns of Negros (*Chapman*).

Nesting in the ground at sea level. Taken from a foray crossing the trail at 450 meters altitude.

Tribe ODONTOMACHINI Mayr

Genus ANOCHETUS Mayr

Anochetus punctiventris var. oceanus Emery.

Anochetus punctiventris subsp. *oceanus* EMERY, Term. Fuzet. 20 (1897) 597. Type locality, New Caledonia.

LUZON, Laguna Province, Los Baños (*Williams*).

Genus ODONTOMACHUS Latreille

Odontomachus infandus F. Smith.

Odontomachus infandus SMITH, Cat. Hym. Brit. Mus. 6 (1858) 81. Type locality, Luzon, Philippines.

NEGROS, Occidental Negros Province (*Banks*), Bureau of Science No. 6908.

Odontomachus papuanus subsp. philippinus Emery.

Odontomachus papuanus subsp. *philippinus* EMERY, Rev. Suiss. Zool. 1 (1893) 203. Type locality, Philippines.

LUZON, Manila (*E. Simon*). ROMBLON (*H. M. Smith*). NEGROS, Oriental Negros Province, Dumaguete, Horns of Negros, 450 meters altitude (*Chapman*).

Odontomachus banksi Forel.

Odontomachus banksi FOREL, Philip. Journ. Sci. § D 5 (1910) 121. Type locality, Luzon, Province of Laguna, Mount Banajao, P. I. *Charles S. Banks* collector.

LUZON, Mount Banahao (*Baker and Williams*). Bureau of Science No. 7181, collected by C. S. Banks.

Odontomachus saevissimus F. Smith.

Odontomachus saevissimus SMITH, Cat. Hym. Brit. Mus. 6 (1858) 80. Type locality, Malluca.

LUZON, Cagayan Province, Port San Vicente Hills (*H. M. Smith*). ROMBLON (*H. M. Smith and L. Morato*).

Odontomachus haematoda Linnæus.

Formica haematodes LINNÆUS, Syst. Nat. ed. 10, 1 (1758) 528. Type locality, South America.

LUZON, Manila (*E. Simon*) : Laguna Province, Los Baños (*Baker and Williams*). MASBATE, Port Cataingan (*H. M. Smith*). ROMBLON (*H. M. Smith and L. Morato*). NEGROS, Oriental Negros Province, Dumaguete, sea level to an altitude of 900 meters (*Chapman*).

ILLUSTRATIONS

PLATE 1

FIG. 1. *Aenictus luzoni* sp. nov., lateral view.
2. *Aenictus luzoni* sp. nov., dorsal view.
3. *Aenictus camposi* sp. nov., lateral view.
4. *Aenictus camposi* sp. nov., dorsal view.
5. *Cerapachys rufithorax* sp. nov., lateral view.
6. *Cerapachys rufithorax* sp. nov., dorsal view.
7. *Cerapachys rufithorax* sp. nov., head, front view.
8. *Cerapachys negrosensis* sp. nov., lateral view.
9. *Cerapachys nitida* sp. nov., lateral view.
10. *Cerapachys nitida* sp. nov., head, front view.
11. *Cerapachys muiri* sp. nov., lateral view.
12. *Cerapachys muiri* sp. nov., head, front view.
13. *Lioponera luzuriagæ* sp. nov., lateral view.
14. *Lioponera luzuriagæ* sp. nov., dorsal view.
15. *Lioponera bicolor* sp. nov., lateral view.
16. *Lioponera bicolor* sp. nov., dorsal view.
17. *Lioponera bakeri* sp. nov., lateral view.
18. *Stigmatomma* (*Fulakora*) *luzonicum* sp. nov., lateral view.
19. *Stigmatomma* (*Fulakora*) *williamsi* sp. nov., lateral view.

PLATE 2

FIG. 1. *Platythyrea maquilingi* sp. nov., lateral view.
2. *Platythyrea maquilingi* sp. nov., head, front view.
3. *Chalcoponera victoria* Ern. Andre var. *andrei* var. nov., lateral view.
4. *Chalcoponera victoria* Ern. Andre var. *andrei* var. nov., head, front view.
5. *Odontoponera transversa* Smith, prothorax, dorsal view.
6. *Odontoponera transversa* Smith var. *biconcentrica* var. nov., prothorax, dorsal view.
7. *Diacamma palawanicum* Emery var. *concentricum* var. nov., petiole, lateral view.
8. *Diacamma palawanicum* Emery var. *concentricum* var. nov., petiole, front view.
9. *Diacamma panayensis* sp. nov., petiole, lateral view.
10. *Diacamma panayensis* sp. nov., petiole, front view.
11. *Diacamma baguiensis* sp. nov., petiole, lateral view.
12. *Diacamma baguiensis* sp. nov., petiole, front view.
13. *Bothroponera williamsi* sp. nov., lateral view.
14. *Bothroponera williamsi* sp. nov., head, front view.

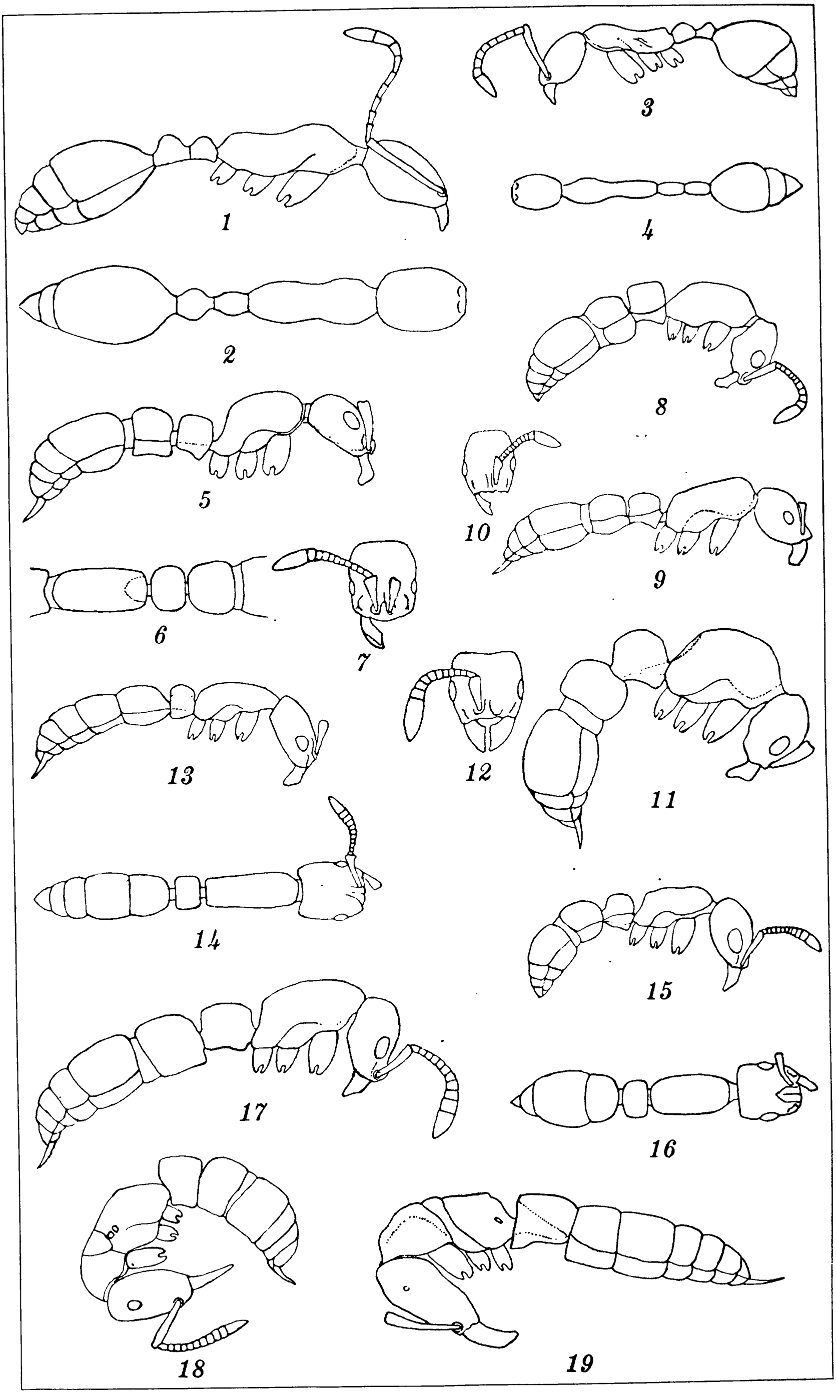

PLATE 1. PHILIPPINE ANTS.

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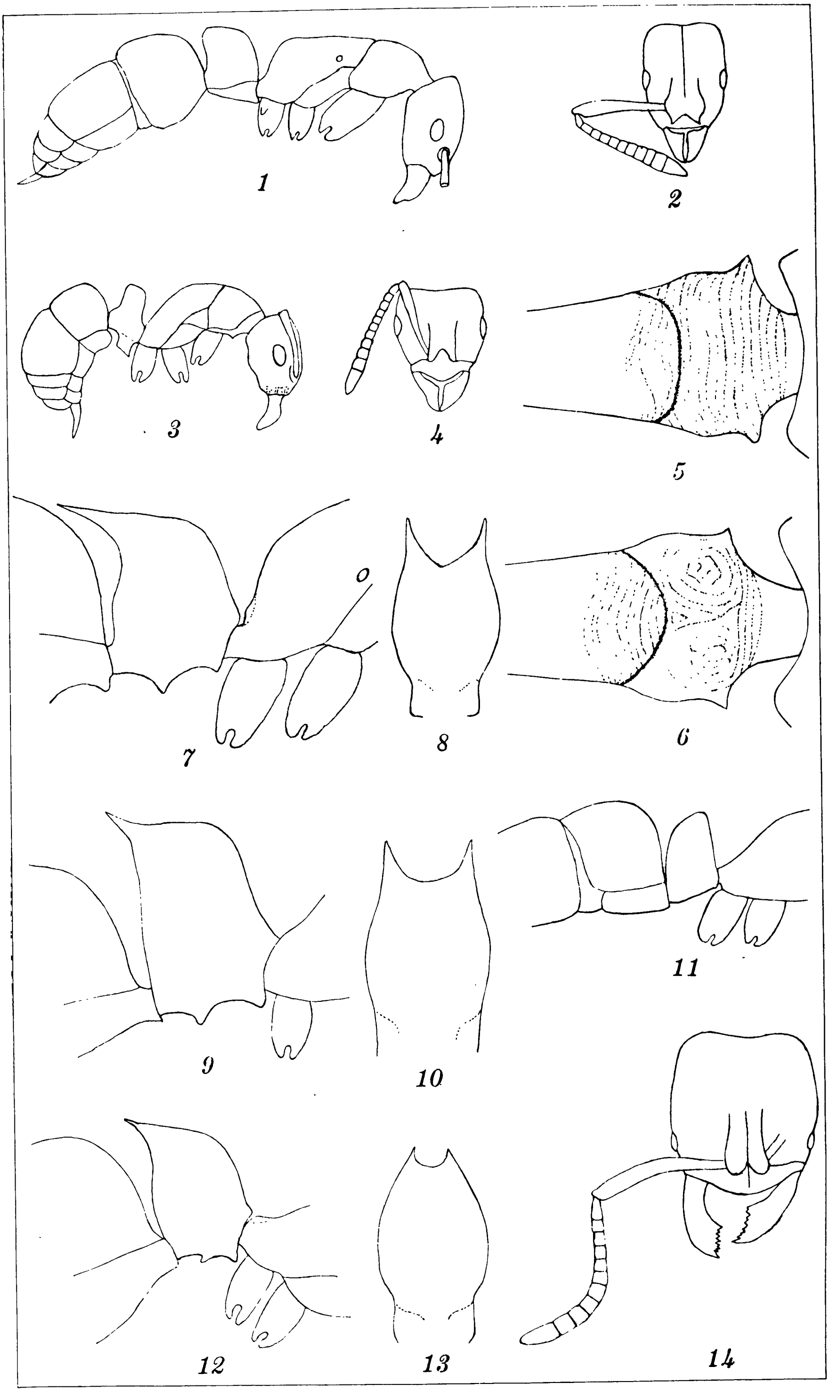

PLATE 2. PHILIPPINE ANTS.

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NOTES ON JAPANESE LEPIDOPTERA AND THEIR LARVÆ: PART VIII

By A. E. WILEMAN

Fellow of the Entomological Society of London

TWO COLORED PLATES

HETEROCERA

DREPANIDÆ

Genus **ORETA** Walker

Oreta WALKER, Cat. Lep. Het. 5 (1855) 1166.

Oreta pulchripes Butler.

Plate 1, fig. 1, larva; fig. 2, head and thoracic segments; fig. 3, food plant. Larva of forma *calceolaria* Butler.

Japanese names: *Oreta pulchripes, ashibeni-kagiba; O. calceolaria, kiobi-kagiba, kimadara-kagiba.*

Oreta pulchripes BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 477; Ill. Typ. Lep. Het. 2 (1878) 15, pl. 25, fig. 7; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 57; LEECH, Proc. Zool. Soc. London (1888) 650, No. 332; Trans. Ent. Soc. London (1898) 371, No. 332; STAUDINGER, Rom. Mém. Lép. 6 (1892) 333; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 128, No. 1046; NAGANO, Nihon Rinshiroi Hanron (Jap.) (1905) 166; (*purchripes*!); Bull. Nawa Ent. Lab. 2 (1917) 41, pl. 3, figs. 10, 11 ♂ [Nawa Konchū Kenkyūjō Hokoku (Jap.)] 131; MATSUMURA, Cat. Insect. Jap. 1 (1905) 49, No. 397; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1909) suppl. 1, 132, No. 232, pl. 13, fig. 6, ♀; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 205, pl. 22, fig. *i*, sex?

Oreta calceolaria BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 478; Ill. Typ. Lep. Het. 2 (1878) 15, pl. 25, fig. 4; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 58; LEECH, Proc. Zool. Soc. London (1888) 650, No. 333; GRAESER, Berl. Ent. Zeit. (1888) 136; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 128, No. 1046*a*; MATSUMURA, Cat. Insect. Jap. 1 (1905) 49, No. 398; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1909) suppl. 1, 131, No. 230, pl. 13, fig. 4, ♀; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 205, pl. 22, fig. *i*, sex?

Oreta loochooana SWINHOE, Trans. Ent. Soc. London (1902) 591.

The larva figured (Plate 1, fig. 1) was taken in June, 1902 (figured, June 17), at Hakodate, Oshima Province, Hokkaido

(Yezo), on *yabu-murasaki,* also named *kome-gome* (*Callicarpa mollis* Siebold and Zuccarini). It pupated on June 21, 1902, and a female imago of the form *calceolaria* emerged on July 8, 1902. Graeser found the larva of *pulchripes* at Vladivostok in June on *Viburnum* and bred eighty-four specimens of both *Oreta pulchripes* and *O. calceolaria* from the same larvæ. I describe the larva from my artist's original figure as follows:

Larva.—Length from head to end of anal tail, about 35 millimeters. Head bifurcated, grayish brown; dorsally yellowish gray; laterally dark brown; a violet-gray patch extending mediolaterally to the prolegs from segment 7 to segment 10; a white subdorsal stripe from segment 2 (next head) to segment 6 from whence the stripe is faintly continued to the anal segment; a broad white spiracular stripe from segment 2 to segment 4; two white stripes, on segments 5 and 6, conjoined at the base by a semicircle and directed obliquely upward and forward; a whitish stripe from segment 11 to anus inclosing two, small, brown diamond-shaped spots; anal segment prolonged into a tail, about 7 millimeters in length; (single ? or paired ?) acuminate dorsal process on segment 4; legs and prolegs brownish.

Imago.—Staudinger[1] remarks:

> According to Graeser there is no doubt that *pulchripes* [Butler] is merely the far rarer reddish brown form (aberration) of the reddish brown and yellow coloured *calceolaria* Butler, which would have been extremely probable, even without the proof afforded by breeding and by the discovery by Graeser of both forms in copula.

Strand, quoting Graeser, remarks as follows:

> Larvae in June on Viburnum. They are marbled with grey, brown and reddish and are said to have the shape of the larva of Drepana (species?), but are "much larger;" they are found singly on the upper side of leaves and are said in order to pupate to roll a part of the leaf together so as to form a tube closed at both ends by a white web. (Strand.)

The remarks about the larva rolling up a part of the leaf to form its cocoon are quite correct, and *Oreta calida* Butler has the same habit.

Pryer[2] states that the larva of *Oreta calceolaria* feeds on the wild grape.

Leech[3] observes of *O. pulchripes* that—

> There is much variation in tone of colour and definition of markings in this species. Some examples are dark reddish brown with a lilacine

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[1] Rom. Mém. Lép. 6 (1892) 333.

[2] Trans. Asiat. Soc. Jap. 12 (1884) 58, No. 248.

[3] Proc. Zool. Soc. London (1888) 650.

suffusion, others are pale yellowish brown, tinged with rosy lilacine, especially along the costa of primaries. Then as regards the linear markings, these in the darker-coloured examples are not very distinct; but in pale specimens they are conspicuous. Often the area enclosed by the transverse lines is darker than rest of wing, thus giving a band-like character. The costal black spots as well as that at external angle are not always clearly defined and are often quite absent, whilst two examples have a colon-like spot at external angle. When the outer grey line of primaries is well defined, it can be traced from the outer costal spot, from whence it runs for a short distance towards external margin, then turning sharply inwards continues its course to near the middle of the wing, when it curves gently and terminates on the inner margin; the costal extremity of yellow border of this line is sometimes placed in a pale apical patch.

Of *O. calceolaria* the same author remarks:

> In this species the reddish-brown colour of wing-markings is a variable quantity. Sometimes the entire areas representing the basal two thirds of primaries and basal third of secondaries are reddish brown. The sulphur colour on the outer portion of all the wings is often sprinkled with dark grey dots, and sometimes a larger spot or two occurs at external edge of primaries. All the characters, both structural and ornamental, of this species are identical with those found in *O. pulchripes*, and the only difference I can see between the two insects is one of colour.
>
> *Calceolaria* is a yellow form of *O. pulchripes*, and is much commoner than the type.[4]

Graeser regards the commoner yellow form *calceolaria* as the ancestral type, *Stammart.*

Local distribution.—Honshu, Musashi Province, Tokyo and Yokohama, May, June, and July (*Wileman*): Yamato Province, Ominesan and Yoshino, June, July, and September (*Wileman*): Shimotsuke Province, Nikko, August (*Wileman*): Shinano Province, Oiwake (*Pryer*): Hida Province, Norimasa, July and August (*Nagano*). Shikoku, Iyo Province, Senzoku, June (*Wileman*). Hokkaido, Oshima Province, Hakodate, July (*Wileman*), August (*Leech*). The types of *Oreta pulchripes* and *O. calceolaria* are both from Yokohama (*Jonas*). Matsumura, who separates *O. pulchripes* and *O. calceolaria*, records them from Honshu only.

Time of appearance.—Larva, June; imago, May to September. Probably there are two broods annually.

General distribution.—Eastern Siberia (Amurland, Ussuri); West China; Japan; Loochoo Islands (Ryukyu) (*Strand*). Manchuria (*Matsumura*).

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[4] Leech, Trans. Ent. Soc. London (1898) 372.

Oreta calida Butler.

Plate 1, fig. 4, larva; fig. 5, head; fig. 6, food plant.

Japanese names, *futatsume-kagiba, kurosuji-kagiba, gamazumi no imomushi-chō.*

Oreta calida BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 477; Ill. Typ. Lep. Het. 2 (1878) 14, pl. 25, fig. 6; LEECH, Proc. Zool. Soc. London (1888) 649, No. 331; Trans. Ent. Soc. London (1898) 372, No. 335; MATSUMURA, Cat. Insect. Jap. 1 (1905) 48, No. 396; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] suppl. 1, 131, No. 229, pl. 13, fig. 3 ♂; NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] 13 (1909) 222, pl. 11, figs. 1–10, ova, larva, pupa, imago; Nihon Rinshirui Hanron (Jap.) (1905) 166, pl. 3, fig. 2; Bull. Nawa Ent. Lab. 2 (1917) 43, pl. 3, fig. 13 ♀, pl. 10, figs. 7–13 [Nawa Konchū Kenkyūjō Hōkoku (Jap.)] 135; SASAKI, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 3, 61, pl. 192, larva, imago; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 205, pl. 22, fig. *i*, sex?

The larva figured (Plate 1, fig. 4) was taken in July, 1902 (figured, July 3), at Hakodate, Oshima Province, Hokkaido (Yezo), on *awaha* (= ? *awaki, Lindera glauca* Blume). Awaha is the Japanese name given by my Japanese collector for the food plant, but I am unable to find such a name in J. Matsumura's Shokubutsu Mei-i. A male imago emerged from this larva on July 24, 1902, and two females from similar larvæ on July 11 and 26, 1902. I also bred two imagoes from larvæ taken in Tokyo, Honshu, which were found on *keyaki* (*Zelkowa acuminata* Planchon var. *keaki* Siebold). These two larvæ pupated on May 16 and 25; and the imagoes probably emerged in June, but no record was kept.

The larva, as will be observed from the figure (Plate 1, fig. 4), differs considerably in color from that of *Oreta calceolaria* Butler (Plate 1, fig. 1). I describe the larva from my artist's original figure as follows:

Larva.—Length from head to anal tail, about 35 millimeters. Head bifurcated, dark brown, marked with a pale ochraceous inverted V-shaped mark and pale ochraceous at the sides. The color dorsally is a very dark brown, which is interrupted dorsally at segment 4 by a green patch extending laterad; mediolaterally green, interrupted at segments 4 and 5 by a broad dark brown patch proceeding from the dorsum laterad, and directed obliquely upward and forward; from this dark brown patch the mediolateral green color takes a half-moon shape from segment 5 to segment 10 and then proceeds attenuated, being almost interrupted by the dorsal dark brown color, to the anal segment; a grayish brown subspiracular stripe faint on the anterior segments, broad on segments 6 to 10, and attenuated from segment 11 to anus; a long anal tail, about 7 millimeters in length, slightly hairy; legs and prolegs grayish (single? or paired?); short tubercles on segments 2, 3, and 4 and an acuminate, thorn-shaped (single? or paired?) process, with the point projecting anad, on segment 5.

Pupa.—Pupa inclosed in a cocoon spun in a rolled-up leaf in the same manner as *Oreta pulchripes* Butler.

Imago.—My females of this species differ a good deal in color from the male, being a dark umber brown, mottled with black instead of a "laky brown mottled with black" as described by Butler. Leech[5] remarks that "the brown coloration varies in tint from greyish to laky brown; both sexes have a discal series of black dots on primaries."

Nagano[6] comments on *Oreta calida* Butler, as follows:

> Egg.—Elliptical, densely covered with microscopic granules, yellow at first, becomes brown afterwards. Length, 0.6 mm.
>
> Larva.—Body colour variable. Generally head dark brown, tinged with ochreous, scattered over with yellowish gray granules, horn-like process on epecranium. Body green; dorsal area of pro- and mesothorax dark brown; prothorax with a pair of ochreous processes on the dorsum; metathorax with a dark brown fleshy horn, scattering minute granules; dorsal area of 1st–7th abdominal segments dark brown; incomplete dark-brown subdorsal line from 3rd thoracic to 6th abdominal; lateral side of 1st abdominal with oblique dark-brown dash; lateral side of 2nd–6th abdominals with blackish brown Λ-shaped line; tail-like process dark brown with two pale yellow rings, densely covered with minute granules; basal line much wrinkled, whitish or yellowish anteriorly and posteriorly, pale pinkish in 2nd–6th abdominal segments, scattering white granules; ventral surface grayish white. Length about 42 mm, from the head to the tail's tip.
>
> Pupa.—Elliptical, brown; abdominal area tinged with ochreous more or less; a pair of short spines on the head. Head and thorax covered with yellow or white powder. Length about 28 mm.
>
> Remarks.—Generation may be twice or thrice per annum. Larva feeds on Viburnum dilatatum, V. sieboldi, V. odoratissimum in April and when mature it spins a cocoon, rolling up a leaf of the food-plant, to pupate therein after 2 or 3 days. Pupal stage lasts about two weeks and moth appears from the middle of May to the beginning of June. The second sex appear from the end of July to the middle of August. Sometimes moths appear from the end of September to the beginning of October, these may be a third generation. How it passes the winter is unknown as yet, but once the moth was taken in December; perhaps it hibernates.
>
> Local distribution. Hokkaidō; Honshū (Tokyo, Yokohama, Oiwake, Gifu, Minoo).

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[5] Proc. Zool. Soc. London (1888) 650.

[6] Bull. Nawa Ent. Lab. 2 (1917) 43.

Local distribution.—Honshu, Musashi Province, Yokohama (*Jonas and Pryer*); Tokyo, June? (*Wileman*): Shinano Province, Oiwake (*Pryer*). Hokkaido, Oshima Province, Hakodate and Junsai Numa, July and August (*Wileman*). Matsumura records the species from Hokkaido and Honshu. The male and female types are from Yokohama (*Jonas*) and Hakodate (*Whitely*).

Time of appearance.—Larva, May and July; imago, June?, July, August.

General distribution.—Japan (*Strand*).

Genus **KONJIKIA** Nagano[7]

Drepana SCHRANK, Fauna Boica ii (1802) 2, 155.

Konjikia NAGANO, Bull. Nawa Ent. Lab. 2 (1917) 39; [Nawa Konchū Kenkyūjō Hōkoku (Jap.) 124].

Konjikia crocea Leech.

Japanese names, *ukon-kagiba, kiiro-kagiba.*

Drepana crocea LEECH, Proc. Zool. Soc. London (1888) 649, No. 329, pl. 32, fig. 7; Trans. Ent. Soc. London (1898) 365, No. 310; KIRBY, Cat. Lep. Het. (1892) 734; MATSUMURA, Cat. Insect. Jap. 1 (1905) 49, No. 401; Nihon Rinshirui Hanron (Jap.) (1905) 167, pl. 3, fig. 11; STRAND, Seitz's Macrolep. Faun. Pal. 2 (1911) 201, pl. 23, fig. *b*, sex?

Konjikia crocea NAGANO, Bull. Nawa Ent. Lab. 2 (1917) 39, pl. 3, ♂, fig. 19; pl. 9, figs. 10–14; Nawa Konchū Kenkyūjō Hōkoku (Jap.) 124, fig. 7 (pupa, after Yano).

Owing to pressure of work my artist was unfortunately unable to figure the larva of this species before it pupated. I beat several larvæ from *akagashi* (*Quercus acuta* Thunberg), at Kobe, Settsu Province, in May, 1901, and bred a female imago of *Drepana crocea* from one of these in June, 1901. The larva is a most curious one, having short, vertical, paired, dorsal processes on several of the segments which are capable of being appressed close to the body or erected vertically at the will of the larva. When the larva falls into the beating tray, it depresses these processes and, feigning death, simulates a dead leaf. After a time it revives and elevates its processes. I am unable to give any description of the larva further than that it was brown, as I took no notes. I kept the empty pupa case of the female imago bred in June, and the following is a description of it:

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[7] This generic name is derived from *konjiki,* meaning in Japanese "golden color," the type species being golden yellow. Type, *Drepana crocea* Leech.

Pupa.—Length, 20 millimeters. Color shining whitish brown; abdominal rings, thorax, and wing cases much darker; anal cremaster long and pointed, about 2.5 millimeters long. Two light-colored processes about 2 millimeters long protrude from the head and each of these is tipped with a trifid knob, which somewhat resembles a crab's claw. So far as I am aware the larva is unlike that of any other *Drepana* larva in Japan.

Nagano comments on *Konjikia crocea* as follows:

> Pupa.—One pair of curious horns, dilating at the top, on head (Fig. 7 in Japanese text).
>
> Life history unkown, but it is clear that there are two generations every year, as the moths appear in May–June and again in October–November at Gifu. It is supposed that the larva feeds on Quercus serrata [Thunberg]. According to Yano's figure the pupa is spindle shaped, with dull front; pale brown tinged with dark green; two curious horn-like processes, having a short branch and dilating top, on the head; a series of pinkish white rings on dorsum of abdomen.
>
> Local distribution. Honshu (Nikko, Kōnosu, Tokyo, Gifu).

Local distribution.—A series of seven males and four females in the Wileman collection from the following localities: Honshu, Musashi Province, Tokyo, June, October: Yamato Province, Yoshino, July, September, October: Settsu Province, Kobe, June, bred.

Time of appearance.—Larva, May; imago, June, July, September, October.

General distribution.—Japan; western China. (*Leech.*)

ZYGÆNIDÆ

ZYGÆNINÆ

Genus **ZYGÆNA** Fabricius

Zygæna FABRICIUS, Syst. Ent. (1775) 550.

Zygæna niphona Butler.

Plate 1, fig. 7, larva, dorsal aspect; fig. 8, larva, lateral aspect; fig. 9, food plant.

Japanese names, *benimon-madara, hi-kanokoga.*

Zygæna niphona BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 393; Ill. Typ. Lep. Het. 2 (1878) 4, pl. 21, fig. 9; LEECH, Proc. Zool. Soc. London (1888) 597, No. 73; Trans. Ent. Soc. London (1898)

325, No. 184; KIRBY, Cat. Lep. Het. 1 (1892) 73; STAUDINGER, Rom. Mém. Lép. 6 (1892) 251; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 383, No. 4347; MATSUMURA, Cat. Insect. Jap. 1 (1905) 181, No. 1513; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1911) suppl. 3, 71, No. 618, pl. 35, fig. 23, ♀; SEITZ, Macrolep. Faun. Pal. 2 (1909) 25, pl. 6, fig. e, ♂ ♀.

Zygæna christophi STAUDINGER, Rom. Mém. Lép. 3 (1887) 173, pl. 8, fig. 9.

The larva figured (Plate 1, figs. 7 and 8) was taken in June, 1902 (figured, June 28), at Hakodate, Oshima Province, Hokkaido, on *kitsune-mame,* also known as *tankiri-mame* and *kinchaku-mame* (*Rhynchosia volubilis* Loureiro). It pupated on July 25, 1902, and a female imago emerged on August 20, 1920. Four other imagoes were bred from similar larvæ on August 11 and 16, 1902. I describe the larva from my artist's original figure as follows:

Larva.—Length, about 21 millimeters. Head black, tipped with white at the mandibles. Color green. A mediodorsal, rather broad white stripe; a mediolateral, narrower white stripe on each side, bordered above by a row of eleven minute black dots situated just above the stripe on the segmental sutures of each segment, commencing at segment 3 and ending at segment 12; eleven small yellow spots are also placed beneath each black dot and are situated on the stripe; there is an additional one on segment 2; spiracles similar in shape, color, and size to the upper row of small black dots; legs, prolegs, and claspers whitish, tipped with black at the base.

The larva of *Z. ephialtes* Linnæus (= *falcatæ* Boisduval), a description of which is given by Seitz,[8] seems somewhat to resemble that of *Z. niphona* Butler. *Zygæna peucedani* Esp. (= *hippocrepidis* Herrich-Schäffer; *aeacus* Hübner), with six spots, is given by Seitz as a "red form of ephialtes Linn., similar in appearance to red-belted *filipendulae* resp. *trifolii* ab. *orobi.*"

Staudinger[9] remarks that—

> * * * there cannot be the slightest doubt that *Z. peucedani* which Bremer[10] brought from Amurland (taken by Radde in the Bureja Mountains, by Maack at Sangatscha, by Wulffius at Possiet Bay and Port Bruce), belongs to this [*Zygæna niphona* Butler].

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[8] Macrolep. Faun. Pal. 2 (1909) 24.

[9] Rom. Mém. Lép. 6 (1892) 251.

[10] Lep. Ost. Sib. (1864) 36.

Zygæna christophi Stgr., which, according to Staudinger, is identical with *Z. niphona* from Japan, is found in eastern Siberia (Amurland and Ussuri).

Seitz[11] comments on *Z. niphona* Butler as follows:

> The only Burnet from East Asia. * * * Though the species varies considerably, some specimens being 6-spotted and resembling therefore *Z. peucedani,* there are no local races.

The description of the larva of *Z. ephialtes* Linn. is as follows:

> Larva yellow or green, reddish yellow at the sides, with pale belts; a dorsal stripe and subdorsal rows of spots black; above the legs rows of black dots; on the whole similar to the larva of *filipendulae;* in May adult on Vetch, Trefoil, Thyme, Eryngium, Plantago, etc.; the black pupa in a white-yellow silky cocoon.

Pupa.—The pupa of *Z. niphona* is inclosed in a yellow, leathery, glazed, fusiform cocoon.

Imago.—Leech[12] remarks:

> There may be either five or six spots on the upper surface of the primaries; but the sixth spot is always indicated on the under surface, sometimes only faintly. Butler's figure represents a specimen with the spots confluent, and I have two similar specimens in my series; but such variation does not appear to be of frequent occurrence.

Butler's type of *Zygæna niphona* is said to have come from Yokohama, Honshu. I doubt the correctness of this locality, as I have never known *Z. niphona* to be taken near Yokohama on the plains and think it very probable that the type was taken by Jonas somewhere in the mountains of Shinano in the region of Mount Asama.

Local distribution.—Honshu, Shinano Province, Karuizawa, August (*Wileman*); Oiwake (*Pryer*): Yamato Province, Dorokawa (*Wileman*). Hokkaido, Oshima Province, Hakodate, August (*Wileman, Leech*). Matsumura records the species from Honshu only. It seems to frequent the mountains in Honshu at elevations of from 610 to 914 meters (2,000 to 3,000 feet), while in Hokkaido, in a more-northern latitude, it is found on the plains.

Time of appearance.—Larva, June; pupa, July; imago, August.

General distribution.—Eastern Siberia (Amurland, Ussuri); Japan. (*Leech.*)

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[11] Macrolep. Faun. Pal. 2 (1909) 25.

[12] Trans. Ent. Soc. London (1898) 325, No. 184.

LIMACODIDÆ

Genus **CNIDOCAMPA** Dyar

Cnidocampa DYAR, Proc. U. S. Nat. Mus. 28 (1905) 952.

Cnidocampa flavescens Walker.

Plate 1, fig. 10, larva; fig. 11, cocoon; fig. 12, food plant.

Japanese names, *iraga, iramushiga.*

Monema flavescens WALKER, Cat. Lep. Het. 5 (1855) 1112; BUTLER, Ill. Typ. Lep. Het. 2 (1878) 14, pl. 25, fig. 5; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 41; FIXSEN, Rom. Mém. Lép. 3 (1887) 342; LEECH, Proc. Zool. Soc. London (1888) 610, No. 148; Trans. Ent. Soc. London (1899) 103, No. 366; (*Miresa*) GRAESER, Berlin Ent. Zeit. 32 (1888) 121; STAUDINGER, Rom. Mém. Lép. 6 (1892) 300; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 392, No. 4433; (*Monema*) DE JOANNIS, Bull. Ent. Soc. France (1896) 147; GRIBODO, Bull. Ent. Soc. France (1896) 179; DU BUYSSON, Ann. Ent. Soc. France 67 (1898) 80; Bull. Ent. Soc. France (1901) 29; MATSUMURA, Nihon Gaichuhen (Jap.) (1899) 77, pl. 33, ova, cocoon, imago ♀; Thousand Insects of Japan [Nihon Senchū Zukai (Jap.)] (1911) suppl. 3, 45, No. 573, pl. 33, fig. 19, imago ♀; Cat. Insect. Jap. 1 (1905) 184, No. 1533; KRAEPELIN, Mitth. a. d. Naturhist. Mus. Hamburg 18 (1901) 196; (*Monema*) NAGANO, Insect World [Konchū Sekai (Jap.)] 6 (1902) 53, cocoon, imago ♀; SASAKI, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910), pt. 3, 68, pl. 195, larva, pupa, cocoon, imago; Insects Injurious to Fruit Trees [Kajū Gaichūhen (Jap.)] ed. 5 (1911) 203, pl. 65, larva, cocoon, imago; (*Miresa*) SEITZ, Macrolep. Faun. Pal. 2 (1912) 344, 449, pl. 50 fig. C.

Monema flavescens forma *nigricans* DE JOANNIS, Bull. Ent. Soc. France (1901) 251.

Cnidocampa flavescens DYAR, Proc. U. S. Nat. Mus. 28 (1905) 952, fig. 19, larva, fig. 20, cocoons; FERNALD, Bull. Hatch Exp. Station, Mass. Agr. Coll. 114 (1907); FERNALD and SUMMERS, Ent. News 18 (1907) 321; DICKERSON, Ent. News 18 (1907) 373; JOUTEL, Journ. N. Y. Ent. Soc. 15 (1907) 175; DYAR, Proc. Ent. Soc. Washington 11 (1909) 162, pl. 14, figs. 1–4.

The larva figured (Plate 1, fig. 10) was taken in September, 1900 (figured, September 27), at Yoshino, Yamato Province, Honshu, on dwarf oak, Japanese name *kunugi* (*Quercus serrata* Thunberg). It spun on October 5, 1900, and an imago (sex?) emerged on June 12, 1901. Two male and four female imagoes also emerged on June 12 and 13, 1901, from similar larvæ reared by me. I have taken the larvæ on Spanish chestnut (*Castanea vulgaris* Lamarck var. *japonica* de Candolle) and on dwarf oak, Japanese name *konara* (*Quercus glandulifera* Blume). It seems to be polyphagous. The larva urticates severely, and a disagreeable shock is experienced if the hand happens to come in contact with it, when searching for larvæ among the leaves of a tree.

Dyar[13] mentions the "special structural characters, affinities, habits, etc." of the larva accompanied by a full description of its eight larval stages. These are illustrated by excellent figures of the first and fifth stages of the mature larva, and of the caltrop spines of the mature larva greatly enlarged.

As the larva has already been described by many entomologists I refrain from doing so but give the short description contained in Seitz's Macrolepidoptera[14] as follows, referring those who wish for more-complete details to Dyar's life history of the species:

> The larva is green with broad violet-brown dorsal stripe, and armed with setiferous warts; it feeds on deciduous trees, particularly Elm, and rests on the underside of the leaves. Korb figures the larva, the setiferous tubercles being distinct in the figure, long on the anterior and posterior segments, and much shorter on the central ones. The dorsal stripe is irregular, being widened on the thoracical segments in the shape of a shield. The caterpillar spins in the autumn a very pretty whitish cocoon, with markings like a bird's egg consisting of minutely divided, dark longitudinal splashes, the cocoon being thus rendered similar to that of the Japanese *Setora nitens*. In this cocoon the larva remains until the next June without changing into a pupa. The species is exceedingly numerous, the larvae occurring in abundance on all kinds of deciduous trees, but full-fed larvae are often parasitised. The cocoons have lately been brought to Europe in quantities, but only a few give results, many dying because the unchanged larva appears to suffer much more from transport than the pupa.

Sasaki[15] gives figures and descriptions of the larva, pupa, cocoon, and imago and a short life history of the species. He says:

> The larva appears about the commencement of September and feeds upon *kaki* [persimmon, *Diospyros kaki* Linnæus]; *hyakujikkō* [or *sarusuberi* (*Lagerstrœmia indica* Linnæus)]; *sakura* [cherry, *Prunus* sp.]; *nashi* [pear, *Pirus* sp.]. It is full grown from the end of September to November. The cocoon is popularly known as *suzume no tago*[16] [sparrow's bucket] and also as *suzume no ogoke* [sparrow's box].[17]

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[13] Proc. U. S. Nat. Mus. 28 (1905) 952, figs. 19 and 20; Proc. Ent. Soc. Wash. 11 (1909) 162, pl. 14, figs. 1–4.

[14] Macrolep. Faun. Pal. 2 (1912) 344.

[15] Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 3, 68, pl. 195, larva, pupa, cocoon, imago; Insects Injurious to Fruit Trees [Kajū Gaichūhen (Jap.)] (1911) 203, pl. 65.

[16] *Tago* is a bucket carried on the shoulder by means of a pole. Another name, not given by Nawa, is *suzume no tamago*, or sparrow's egg.—A. E. W.

[17] *Ogoke*, a round wooden box anciently used in twisting and joining threads of hemp together preparatory to twisting into a cord.—A. E. W.

It hibernates in the larval stage inside its cocoon and changes to a pupa in the following spring. The imago emerges from the cocoon in the following August.

Matsumura [18] gives figures and descriptions of the ova, cocoon, and imago, and a life history of the species. He says that—

> * * * it is single brooded and hibernates in the larval stage. Before it hibernates it spins its egg-shaped cocoon and passes the winter inside it, changing into a pupa in the following May or June. The imago emerges in about three weeks after the pupa is formed. The female lays some two hundred eggs which take about ten days to hatch. The larvæ are full grown about the end of September when they spin their cocoons, and hibernate as previously stated. The larva urticates severely and produces a rash.

Other food plants given by Matsumura are *kihada* [Latin name?; *kuwa* [mulberry, *Morus* sp.]; *ringo* [apple, *Pirus* sp.]; *ume* [plum, *Prunus* sp.]; *kankitsu* [Latin name?]; *sumomo* [*Prunus communis* Hudson]; *biwa* [loquat, *Eriobotrya japonica* Lindley].

Pryer states as follows:

> Feeds on the celtis [*enoki* (*Celtis sinensis* Persoon)] and elm [Japanese name, *buna no ki* (*Fagus* sp.)]. Forms an oval, very hard and smooth cocoon, mottled with white and brown, very much resembling a bird's egg; the larva spins up in the autumn but does not change to a pupa until spring.

Nawa [19] gives figures of the cocoons and imago and a popular account of its transformations. He says that—

> * * * the larva, which is generally known as iramushi [stinging grub], is also locally known in various places as *okoze, shibamushi, hankyōji,* and is employed as a specific for certain diseases. It has several Sinico-Japanese names and is referred to as a drug in a book named Honsōshō [The Book of Plants, Author?]. Names similar to the Japanese names for the larva also exist in China.

In addition to *kaki* [persimmon, *Diospyros kaki* Linnæus], he gives *katsume* [*Zizyphus vulgaris* Lamarck var. *inermis* Bunge] as a food plant.

> The cocoon is correctly known as suzume no tsubo [sparrow's jar]; provincially, or locally, it goes by the names of suzume no makura [sparrow's pillow], suzume no tago [sparrow's bucket], suzume no tsubo [sparrow's jar].
>
> It turns into a pupa inside its cocoon about June or July and is single brooded.

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[18] Japanese Injurious Insects [Nihon Gaichūhen (Jap.)] (1899) 77, pl. 33; Thousand Insects of Japan [Zoku Nihon Senchu Zukai (Jap.)] (1911) suppl. 3, 45.

[19] Nawa's Insect World (Konchū Sekai) 6 (1902) 53.

All the foregoing names seem to have been given to the cocoon (Plate 1, fig. 11) on account of its resemblance to a sparrow's egg, which Pryer and other authors also notice.

Dyar describes the cocoon as follows:

> Cocoon.—Elliptical, rounded, smooth, hard, and dense, firmly attached upon one side to the bark of the tree. White and gray-brown, marked in a peculiar pattern. Usually there are several broad brown streaks radiating from each pole of the cocoon, but the colors may also be variously intermixed, or even nearly uniform gray. The moth emerges by a circular lid, of which there is no sign from the interior.

He enumerates the food plants as follows:

> Food-plants.—Various deciduous trees and shrubs. Gribodo records pear and rose. Kraepelin found the cocoon on maple. Fernald found the Norway maple the preferred food, but also pear, apple, cherry, and less commonly willow, birch, oak, elm, blackberry, beech, poplar, mountain-ash, buckthorn, and rose. My larvae fed readily on wild cherry, though the liberated moths did not oviposit on this tree, but on maple, rose, and cultivated plum.

Local distribution.—Honshu, Musashi Province, Tokyo, June: Yamato Province, Yoshino, July: Settsu Province, Kobe, June (*Wileman*). Hokkaido, Oshima Province, Hakodate, June, July (*Leech*). Matsumura records the species from Hokkaido, Honshu, Shikoku, and Kyushu. The type is from northern China.

Time of appearance.—Ovum, June and July?; larva, August to November; cocoon, October to May or June of following year. The larva hibernates inside the cocoon and changes to a pupa inside it between April? and June or July of the following year.

Imago.—June to August of following year. Single brooded.

General distribution.—Korea; central and northern China; eastern Siberia (Ussuri, Amurland); Japan. (*Leech.*)

ÆGERIADÆ

Genus **PARANTHRENE** Hübner

Paranthrene HÜBNER, Verzeichniss (1822) 128; BARTEL, Seitz's Macrolep. Faun. Pal. 2 (1912) 376, 379.

Sciapteron (recte *Sciopterum*) STAUDINGER, Diss. de Sesiis agri Berol. 43 (1854).

Paranthrene regale Butler.

Plate 2, fig. 1, larva, lateral aspect; fig. 2, larva, dorsal aspect; fig. 3, food plant.

Japanese name, *budō-sukashiba.*

Sciapteron regale BUTLER, Ill. Typ. Lep. Het. 2 (1878) 60, pl. 40, fig. 3; LEECH, Proc. Zool. Soc. London (1888) 591, No. 47; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 39; MATSUMURA, Nihon Gaichūhen (Jap.) (1899) 263, pl. 114, imago; Cat. Insect. Jap. 1 (1905) 187, No. 1559; Thousand Insects of Japan (Zoku Nihon Senchū Zukai) (Jap.) (1911), suppl. 3, 88, 745, pl. 36, fig. 21, ♀; SASAKI, Kwajū Gaichūhen (Jap.) (1911) ed. 5 (1911) 136, pl. 36, larva, imago ♀.

Paranthrene regale Butler, BARTEL, Seitz's Macrolep. Fauna Pal. 2 (1912) 380, pl. 51, fig. *b*, sex?

The larva figured (Plate 2, fig. 1) was taken in December, 1900 (figured, December 5), at Kobe, Settsu Province, Honshu. It was feeding, as represented in the figure, inside the stem of the wild grapevine, Japanese name, *yama-budō* (*Vitis coignetiæ* Pull.). I did not succeed in rearing an imago from this larva, which died, and hitherto have been unable to identify it with absolute certainty as being that of *Paranthrene* (*Sciapteron*) *regale* Butler, although, owing to the fact that Pryer states that *yama-budō* is the food plant of *P. regale,* I have always suspected that my figure represented the larva of that species. I have lately perused the works of Matsumura and Sasaki, and it will be noted from the following quotations taken from them that they also give *yama-budō* as the food plant of *P. regale* and comment on the "long oval swellings, or nodules," which it causes in the stem, as shown in my figure. My larva also agrees with the figure and description given by Sasaki, who, however, does not mention the dark mediodorsal line distinctly shown in my figure (Plate 2, fig. 2). This evidence I think is sufficiently corroborative, and I feel justified in referring my larva to *P. regale* Butler. I learned from my Japanese collector, to whom I showed my artist's original figure, that the larvæ of *P. regale* are much prized by the Japanese proletariat as a medicine and that nodules of the wild grapevine, each containing one larva, are sold at apothecary shops for about 3 sen each (1.5 cents United States currency). The larva is regarded as an efficacious cure for intestinal pains in adults and for worms in children and is frequently baked and eaten by patients suffering from these maladies. The superstition which is prevalent among the Japanese proletariat concerning the efficacy of certain larvæ to cure diseases is also alluded to under the headings of *Brahmæa japonica*[20] and *Phassus excrescens*.[21] It is akin to a similar superstition which causes some Japanese to eat raw snakes for the purpose of acquiring strength, a custom that I have actually witnessed in my wanderings through Japan. On one occasion, while traveling through a wild and mountainous district in Yamato Province, a peasant, who was employed as porter to carry a load of my baggage, caught and killed a *mamushi* (Japanese viper) which he skinned and partially devoured on the spot, giving as his reason for making this very unsavory and repulsive meal that the mamushi would give him strength.

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[20] Philip. Journ. Sci. 19 (1921) 228.

[21] Postea, pp. 93 and 94.

Pryer[22] comments on *Sciapteron regale* Butler as follows:

> Yokohama; this feeds on the wild grapevine, causing large oval swellings 1 to 3 inches long in the stem. It is the only one of this family I have as yet bred. It is moderately common, and a few hours search will be always rewarded by a number of the fol. [sic], which, if nearly full-fed, can easily be reared.

Matsumura[23] gives a figure of the imago of *Sciapteron regale* Butler and says:

> The larva resembles that of *Aegeria hector* Butler but is larger.[24] When full-grown it measures about one sun [1 Japanese sun, or inch, equals 33 millimeters]. * * * its life history has, so far, not been thoroughly investigated. When the wild grape vine is attacked by the larva an egg-shaped nodule of from 7 bu [23.1 millimeters] to 2 sun [66 millimeters] in length is produced in the locality affected which causes much injury by cutting off the ascension of the sap.

Sasaki[25] gives figures and descriptions of the larva and female imago of *Sciapteron regale* Butler. He says that—

> * * * the larva appears in September and feeds internally on the tissue of the stem of the *yama-budō* [wild grape, *Vitis coignetiæ* Pull.] and the kama-ebi [Latin name?]. It excavates a long, internal channel and is extremely injurious to the stems. The stem in which the larva lives is much swollen and a hole is opened in the side from which the larval excrement issues. It is therefore easy to ascertain the presence of a larva by the swelling and the exudation of excrement. The larva hibernates in the stem. In May of the following year it stops up with silken threads both ends of the long channel which it has excavated, and turns into a pupa inside it. The imagoes begin to emerge at the commencement of June. When the pupa is about to change into a moth it projects the anterior half of its body from the small hole opened in the side of the stalk which it inhabits and the imago then emerges. The full-grown

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[22] Trans. Asiat. Soc. Japan 12 (1884) 39.

[23] Nihon Gaichūhen (Jap.) (1899) 263, pl. 114, imago.

[24] *Aegeria hector* Butler; Matsumura, Zoku Nihon Gaichūhen (Jap.) (1899), 260, pl. 113, larva, pupa, imago; does not feed on *yama-budō* (wild grapevine) but on *ōtō* (*sakurambō*) (Latin name?); *ume*, plum (*Prunus* sp.); *sumomo* (*Prunus communis* Hudson).

[25] Kwajū Gaichūhen (Jap.) ed. 5 (1911) 136, pl. 36.

larva[26] is over 6 bu [18.18 millimeters] in length, of a light yellow color; the head is reddish brown; the cervical plate of segment 1 is yellowish brown and the body emits a few coarse hairs; 3 pairs of legs; 5 pairs of abdominal legs.

Pupa. More than 7 bu [21.1 millimeters] in length, dark brown; the abdominal segments provided with small spines.

In later notes on the larva of the *budō-sukashiba,* Sasaki[27] says:

> * * * the larva of the *budō-sukashiba, Strapteron* [!] *regale* Butl., inhabits the stems of the budō [grapevine] and the no-budō [wild grapevine] and injures the tissues, for which reason this injurious insect is a constant source of trouble to the grape-cultivator. When a larva infests a stem the one in which it lives swells considerably and can therefore be easily distinguished from a sound stem. If a vine is attacked by this larva the strength of the upper part of the stem affected is gradually impaired and it withers away because the circulation of the sap has been stopped at the place where it has been injured.
>
> The larva (*figure* a) hibernates in the stem and changes into a pupa in March or April and the imago emerges at the middle, or end, of May. It is a favourite food of birds and those who keep fowls send out coolies into the fields in winter to collect wild grapevines which contain the larvæ. As previously stated the stems of the affected vines are always swollen and it is therefore easy to recognize those which contain larvæ. These are cut off at both ends but only the parts which are swollen are kept and cut open later on, after which they are given to fowls and small birds by the bird fanciers who purchase them for that purpose. * * * These bird fanciers usually sell the larvæ at one to two sen [about 0.5 to 1 cent United States currency] apiece on which they make a good profit. The injurious larva of the grapevine must, therefore, be called a golden worm as far as the bird fanciers are concerned.

The family Ægeriadæ is now placed in the Microlepidoptera, in the British Museum collection.

Local distribution.—Honshu, Nagato Province, Shimonoseki, July (*Leech*): Musashi Province, Yokohama (*Pryer*): Settsu Province, Kobe (*Wileman*). Kyushu, Satsuma Province, May (*Leech*): Hizen Province, Nagasaki, May, June (*Leech*). Matsumura records this species from Honshu and Kyushu and states that it is not rare in the neighborhood of Kyoto, Honshu. The type is from Yokohama (*Jonas*).

Time of appearance.—Larva, September to May; pupa, May; imago, May to July.

General distribution.—Japan; China (Kiukiang). (*Pratt.*)

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[26] My larva measures 33 millimeters.—A. E. W.

[27] Nawa's Insect World 20 (1916) 3, figs. a, b [Konchū Sekai (Jap.)].

HEPIALIDÆ

Genus PHASSUS Walker

Phassus WALKER, Cat. Lep. 7 (1855) 1566.

Phassus excrescens Butler.

Plate 2, fig. 4, larva; larva of forma *æmulus* Butler? 5, roof over hole of female larva.

Japanese names, *kōmoriga, gusagi no shinkuiga, kiri no teppō-mushi chō.*

Hepialus excrescens BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 482; Ill. Typ. Lep. Het. 2 (1878) 20, pl. 27, fig. 7, ♂; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 40, No. 55; LEECH, Proc. Zool. Soc. London (1888) 645, No. 313; Trans. Ent. Soc. London (1898) 356, No. 282; KIRBY, Cat. Lep. Het. 1 (1892) 889; STAUDINGER, Rom. Mém. Lép. 6 (1892) 289; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 410, No. 4723; MATSUMURA, Cat. Insect. Jap. 1 (1905) 189, No. 1573; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1911), suppl. 3, 54, No. 590, pl. 34, fig. 17, ♂; SEITZ, Macrolep. Faun. Pal. 2 (1912) 438.

Hepialus æmulus BUTLER, Ann. & Mag. Nat. Hist. IV 20 (1877) 482; Ill. Typ. Lep. Het. 2 (1878) 20, pl. 27, fig. 8, ♂; Y. NAWA, Insect World [Konchū Sekai (Jap.)] 5 (1901) 410, pl. 11, larva, pupa, imago ♂ ♀ (*Hepialis*); SASAKI, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 3, 3, pl. 163.

The larva figured (Plate 2, fig. 4) was taken in November, 1900 (figured, November 30), on poplar, *hako-yanagi* (*Populus tremula* Linnæus var. *villosa* Wesm.). I did not succeed in rearing the imago, as the larva died. My Japanese collector identified the larva as that of *Phassus signifer* Walker, which is taken in Japan. I showed a set specimen of *P. signifer* to him, and he recognized it as the imago of my larva and gave me the following information:

> The ova are deposited on the branches of the *kusagi* [*Clerodendron tricotomum* Thunberg] and the *aburagi* [*Acanthopanax sciadophylloides* Franchet and Savatier]. When the ova hatch the young larvæ feed on the leaves for about a month, then begin to burrow into the trunk of the tree. The larva pupates inside the groove it has eaten out of this trunk, and when it has pupated the pupa gradually works its way to the entrance of the hole from which it partially protrudes. If the tree is sharply knocked the pupa recedes into the groove, emerging again later on. In order to procure specimens of the imago in good condition it is necessary to capture them when freshly emerged on the tree trunks as they soon become worn owing to their strong and rapid flight. The imago emerges very early in the morning and is difficult to breed in captivity. The pupa of the male, which measures about 1 inch, is much smaller than that of the female,

which measures about 2 inches. In a good many instances the female larva builds a roof over its hole [Plate 2, fig. 5] composed of excrement thickly matted with silken threads for the purpose of protecting the entrance from rain and ants. The hole made by the female larva is much larger than that made by the male, and the male larva seldom makes a roof as its hole is much smaller.

It is true that the imago has an extremely strong flight, and it seems to be more agile than a sphingid. I have seen it flying at Hakodate, Hokkaido (Yezo), at dusk, when the particular specimen I was observing ascended and descended in the air almost vertically, revolving all the time.

I cannot positively say whether my larva is actually that of *Phassus signifer* Walker or that of *Phassus excrescens* Butler form *æmulus* Butler, as no imago emerged, but it agrees very closely with the figures of the larva of *P. æmulus* given by Nawa and Sasaki and also with Sasaki's description. My larva, however, is longer, measuring 82 millimeters against Sasaki's 44 millimeters and Nawa's 46 millimeters. It is not impossible that *P. excrescens* Butler may prove to be a form of *signifer* Walker, which is recorded from Japan by Leech.

Phassus excrescens is named in Japanese *kōmoriga,* or bat moth, on account of its strong rapid flight which resembles that of a bat.

Pryer[28] comments on *P. æmulus* and *excrescens* as follows:

> Yokohama, very abundant; it emerges late in the autumn; large specimens measuring 4½ to 5 inches in expanse; it is very destructive, particularly to imported fruit-trees, in the stem of which it burrows two years; it is extremely prolific, the body of a full-sized female is two inches long, filled with minute eggs, which it scatters loosely about the tree it feeds on; I have found it in almost all trees except conifers; it often attacks vines, and prefers to burrow in the stem of a tree to which a wisteria [sic] or other climber is attached. The ichneumon that prays [sic] upon this insect is a most extraordinary one; the body is short and oval and measures ½ an inch, but the ovapositor [sic] is 9 inches long. Expanse of wings 1½ inches.

Leech[29] states that—

> *H. excrescens* is closely allied to the Indian *H. pauperatus* Walker; some of the Japanese specimens of the former have the "small black-edged white spots" and other characters of the latter.

Matsumura says that the larva of *Phassus excrescens* Butler feeds internally upon *niwatoko* [*Sambucus racemosus* Linnæus] and *kusagi* [*Clerodendron tricotomum* Thunberg]. He also states[30] that the very closely allied species *Phassus signifer* Walker, which occurs in Japan, also feeds internally on *kusagi* [*Clerodendron tricotomum* Thunberg], *kiri* [*Paulownia tomentosa* Thunberg], and *momo* [peach]. Possibly *P. excrescens* and its form *æmulus* Butler may eventually prove to be merely forms of *P. signifer* Walker which has priority. The larvæ of both *P. æmulus* and *signifer* inhabit the same trees, kusagi and kiri.

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[28] Trans. Asiat. Soc. Japan 12 (1884) 40, No. 55.

[29] Proc. Zool. Soc. London (1888) 645.

Y. Nawa[31] gives much interesting information about this species in an article entitled the "*Kusagi no Shinkuiga* [Kusagi wood-boring moth] (*Hepialus aemulua* [sic] But.) and superstitious beliefs." He says:

> The larva [of *H. æmulus*], which is a wood-borer, lives inside the stems, or trunk, of the *kusagi* tree (*Clerodendron tricotomum* Thunberg), whence is derived its name of *kusagi no shinkuiga* [*kusagi* wood-boring moth]. It seems that the larva was, in former times, employed in the Chinese system of materia medica, then in vogue in Japan, as a cure for children's diseases. It is also known in various localities under the name of *kusagi no mushi* [*kusagi* grub], *kusagi no kikui mushi* [*kusagi* wood-boring grub], *tō no kimushi* [rattan? grub]; *tō-namushi.* It is reported that whenever wood cutters chanced to find the larvæ and to bring them into town people were accustomed to buy them with much eagerness for medicinal purposes.
>
> Hiraga Kyūkei, in his work entitled Butsurui Hintō, states, in an article on the *kusagi* tree, that—"the *kuimushi* [boring grub]," which is found in trees is used in the treatment of children's convulsions for killing worms."

Ono Ranzan, in his work, Honkō Keimō, states in an article on wood borers that—

> * * * the *kikui* [wood-boring grub] is a long grub which lives in the interior of trees and feeds upon them internally. It is like a mulberry worm [silkworm] in shape and its efficacy for curing diseases varies according to the tree which it inhabits. The *kusagi kuimushi* [*kusagi* boring grub] is steeped in soy, split into two halves and is then given to children. It is said to cure them of atrophy and convulsions.

Nawa proceeds to say:

> I dare say that there is nothing extraordinary in the medicinal use of the larvæ of *kikui mushi* [wood borers] which in Japan inhabit trees, such as pine, peach, *katsura* [*Cercidiphyllum japonicum* Siebold and Zuccarini], willow, and mulberry, or of the larvæ of aquatic insects such as the *magotaro mushi* [*Neuromus grandis* Thunberg (Neuroptera)], and it may therefore have happened that the *kusagi no shinkui mushi* [larva of the *kusagi* wood-boring moth, *Hepialus æmulus*] was also given to children in the same

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[30] Thousand Insects of Japan (Zoku Nihon Senchū Dzukai) (1911) suppl. 3, 54, Nos. 589 and 590, pl. 34, figs. 10, ♀, and 17, ♂.

[31] Insect World (Konchu Sekai) 5 (1901) 410, pl. 11, larva, pupa, imago ♂ ♀.

way for the cure of internal diseases, but it would probably be advisable not to enquire too closely into its efficacy for such purposes. Whereas, in former times, it was really only employed for one specific disease, nowadays a sort of superstition invests this kikui mushi [wood borer] with the virtue of being a valuable remedy for consumption. Dishonest local tradesmen have not lost this good opportunity. The virtues of *iki-ibota mushi* [live larvæ of *Brahmæa japonica*], as they are called, are openly advertised by them in their shop windows. They have met the demand of consumptive patients by energetically and publicly advertising their efficacy in their shop windows. This custom has arrived at such a stage that advertisements, similar to the one reproduced below, were to be seen blazoned in capital letters in the center of the City of Nagoya in April of this year [1901]. How appalling the ignorance of my countrymen must be concerning the nature of insects!

> CONSUMPTION, NERVOUS DEBILITY, DYSPEPSIA.
> AN ASTONISHING AND WONDERFUL DRUG!
> IKI IBOTA MUSHI
>
> This grub has, hitherto, not been of frequent occurrence as a dried preparation. It is a live grub and when it moves is all alive and kicking. If only one dose of this grub be taken medicinally it completely cures consumption, however severe, dyspepsia, and nervous debility just as if it had been done by the Gods. There are many drugs in the world but this Iki Ibota mushi is especially efficacious.
>
> —— ——, Apothecary, City of Nagoya.

Previous to seeing this advertisement some persons had written to me from Hokkaido and two or three prefectures to report the existence of the *ibota mushi* [larva of *Brahmæa japonica*]. I imagined at the time they wrote to me that this must be either the *ibota mushi* which is the larva of the shokkō moth [*Brahmæa japonica*], or else, if that were not the case, that it must be the *ibotarō mushi* [*Ericerus pela* Westwood, wax-producing scale insect]; that is to say, a species of *kaigara-mushi*, which is used for oiling cloths and other purposes. Subsequently I read advertisements about *ibota-mushi-chō* [*Brahmæa japonica*, moth] and also personally saw similar advertisements in shop windows. I then understood for the first time that the previous report which I had received from Hokkaido did not refer to the *kaigara-mushi* [*Ericerus* species, wax-producing scale insect], but to the *kikui mushi* [*Hepialus æmulus*].

The imago of the *kusagi no shinkui ga* [*Hepialus æmulus*], generally emerges about September or October and usually flies at dusk. Its flight in the air is exceedingly swift, and owing to its large size in comparison with ordinary-sized species of moths a collector is often apt to mistake it for a kōmori [bat]. The female selects a soft part of the trunk or branches for oviposition, whereby it facilitates the boring of the young larvæ. The head of the larva, namely the *kikui-mushi* [wood-boring grub] is light brown, the abdominal legs are of a light yellowish white and it has altogether sixteen legs. When full-grown it measures 1 sun 4 or 5 bu [46.2 to 49.5 millimeters] long. As has already been stated this moth lives concealed inside trees in its larval stage and eats the internal tissue and it is therefore usually mistaken for the *teppōmushi* [gun barrel grub], which is the larva of the *kamikiri-mushi* [a species of Coleoptera, probably a *Cerambyx* [*kamikiri* grub]. The larva of the *teppōmushi,* however, has only eight legs. Furthermore, the larva [of *Hepialus æmulus*] is always in the habit of ejecting its excrement from a certain part of the tree and of spinning fine silken threads around it, but the larva of the *kamikiri-mushi* is legless in front [and therefore cannot do this]. There is, moreover, special evidence that the larva of the *teppōmushi* lets its excrement fall out of a small aperture which is perforated in some part of the trunk or branches. By giving a little attention to the habits of these two different larvæ the difference between them is clearly understood. The larva of the *kikui mushi* [*Hepialus æmulus*] which inhabits the *kusagi* tree and also the *kiri* tree is quite different from that of the *teppōmushi* [a coleopter]. It causes much loss to horticulturists by the injury it inflicts on these trees. The pupa [of *æmulus*] measures 1 sun and 4 or 5 bu [46.2 to 49.5 millimeters] long, and 2 bu, 5 rin [6.76 millimeters] broad; cylindrical in shape; head and ventrum dark brown, the rest of the body light brown; it generally remains in the groove which it has scooped out. There is no perfect method for exterminating the larva of this moth. Some people kill them by piercing them with copper wire, others put hyakubukon [the root of *Stemona sessilifolia* Miq.] into their holes and wait for them to die. It is sometimes found useful to dissolve an insecticide and to inject it with a syringe, or else to await the flight of the moths at dusk and to capture and kill them. No other methods of extermination have been discovered so far, and there can be no hope of attaining good results in the case of *kiri* and *kusagi* trees unless these be adopted. Those engaged in horticulture must reflect on the matter. When the true character of the *iki-ibota-mushi,* which is welcomed by the public as a specific for consumption, is revealed we find that it is really nothing more than the *kikui-mushi* [*Hepialus æmulus*], to which we have previously alluded and that it is not the genuine *ibota mushi* [*Brahmæa japonica*], but an injurious grub which bores into *kiri* trees. No satisfactory explanation can be offered now as regards its efficacy in effecting the cure of diseases, but judging from the opinions of the two authors, Kyūkei and Ranzan, previously quoted, it is evident that it most certainly possesses no virtue for healing the lungs. Superstition may, indeed, be said to have reached the acme of absurdity, when we find an ignorant public disseminating infection on all sides through the continuance of this superstition and the neglect of proper medical treatment.

The imago of *H. æmulus* mimics a withered leaf when at rest, and Nawa represents it in this attitude with wings folded over the body. Sasaki [32] gives figures, descriptions, and a short life history of *Hepialus æmulus* Butler, which he names in Japanese *kiri no teppō-mushi chō* (the moth of the gun-barrel grub of the *kiri* tree). He says that—

* * * the imago appears between the end of August and the commencement of September and lays its eggs on the *kiri* (*Paulownia*

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[32] Nihon Jūmoku Gaichuhen (Jap.) ed. 3, pt. 3 (1910) 3, pl. 163, larva, pupa, imago.

tomentosa Thunberg). The larvæ which hatch from these eggs enter the core of the tree and commence to feed upon it. It has not been discovered yet for how many years the larva remains inside the *kiri* tree, but probably it lives there for about two years in the larval stage. The larva generally changes into a pupa inside the tree between the end of July and August. The imago emerges at the commencement of September when it drops its eggs on the surface of the leaves. Many of the larvæ burrow into a hole situated at a place five or six feet between the junction of the root and the trunk and vigorously devour the core of the tree both in spring and summer. The larva pierces a small hole in the trunk from which the excrement exudes so that it can be ascertained by the state of the excrement on the surface of the trunk whether a larva is living inside or not. The *kiri* trees which are injured by this larva are perforated with many larva holes and much loss is caused thereby owing to the fact that it injures the core of the trunk and depreciates the value of the timber.

A full-grown larva[33] (4th stage?) measures 1 sun and 5 or 6 bu [about 49.5 to 52.8 millimeters] long; cylindrical in form; head large and round, reddish brown; cervical plate on segment 1 reddish brown, having on each side a black elliptical spot; the anterior half of each segment marked dorsally with a light reddish brown elliptical, or rectangular patch, the posterior half marked dorsally on both sides with a smaller elliptical patch; a reddish brown triangular spot above and behind each spiracle; a long reddish brown patch beneath each spiracle; three small reddish brown spots at the base of the abdominal legs, each spot emitting one or two hairs. I have taken a full-grown larva, but the posterior half of the body was injured and I was therefore unable to ascertain the exact full length. I believe, however, that the larva generally attains a length of over 2 sun [about 66 millimeters].

The head is over 2 bu and 5 rin [about 8.2 millimeters] in width. The head of a larva in the fourth stage is not more than 1 bu and 7 or 8 rin [about 3.53 to 3.56 millimeters] in width, so that one can ascertain whether a larva is full-grown or not by the size of the head.

The pupa is 1 sun and 7 or 8 bu [about 56.1 to 59.4 millimeters] in length; head, thorax and wing cases blackish brown; ventrum ashy yellowish brown; each abdominal segment provided ventrally and dorsally with hard, longitudinal, spiny skin folds. When the pupa is about to change into a moth it projects the anterior half of its body from the hole which has been made in the tree, and the imago emerges.

The ovum is globular, or elliptical; diameter 3 rin [about .09 millimeter]; black, glossy; usually the ova are laid singly on the surface of a leaf, and as they do not adhere to it they fall to the ground.

Local distribution.—Phassus excrescens and forma *æmulus*. Honshu, Musashi Province, Yokohama, April (*Wileman*): Musashi Province, Tokyo, October (*Wileman*): Mino Province, Gifu, September, October (*Nawa*). Hokkaido, Oshima Province, Tobetsu, September (*Wileman*). Kyushu, province?, locality?

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[33] My larva measures 82 millimeters, much larger than Sasaki's measurements.—A. E. W.

(*Leech*). Matsumura records *P. excrescens* and forma *æmulus* from Hokkaido and Honshu.

Phassus signifer. Honshu, Musashi Province, Yokohama (*Pryer*): Shinano Province, Oiwake (*Leech*): Nagato Province, Shimonoseki (*Leech*): Yamato Province, Yoshino, July (*Wileman*). Shikoku, Iyo Province, Ishidzuchi San, June (*Wileman*). Kyushu, Satsuma Province, locality? (*Leech*). Hokkaido, Oshima Province, Junsai Numa, Hakodate, July (*Wileman*). Matsumura records *signifer* from Honshu and Kyushu.

Time of appearance.—Phassus excrescens and forma *æmulus* larva probably takes two years to undergo its metamorphoses and, therefore, lives throughout the year; the imago in April, August, September, October. *Phassus signifer,* imago, June, July; larva, so far undiscovered, perhaps identical with that of *excrescens* = *æmulus.* Pryer says of *P. signifer,* "Yokohama, emerges in the summer, rather scarce."

General distribution.—Phassus excrescens: Eastern Siberia (Amurland); Japan (*Matsumura, Leech*). *Phassus signifer:* India; Burma; Borneo (*Hampson*). Korea; central, western, and northeastern China; Japan (*Leech*). *Phassus excrescens,* type from Yokohama (*Jonas*); forma *æmulus,* type from Yokohama (*Jonas*). Both are in the British Museum collection.

ILLUSTRATIONS

[Drawings by Hisashi Kaidō.]

PLATE 1

FIGS. 1 to 3. *Oreta pulchripes* Butler forma *calceolaria* Butler. *1*, larva; *2*, head and thoracic segment; *3*, food plant.

4 to 6. *Oreta calida* Butler. *4*, larva; *5*, head; *6*, food plant.

7 to 9. *Zygæna niphona* Butler. *7*, larva, dorsal aspect; *8*, larva, lateral aspect; *9*, food plant.

10 to 12. *Cnidocampa flavescens* Walker. *10*, larva, *11*, cocoon; *12*, food plant.

PLATE 2

FIGS. 1 to 3. *Paranthrene regale* Butler. *1*, larva, lateral aspect; *2*, larva, dorsal aspect; *3*, food plant.

4 and 5. *Phassus excrescens* Butler. *4*, larva of forma *æmulus?* Butler; *5*, roof over hole of female larva.

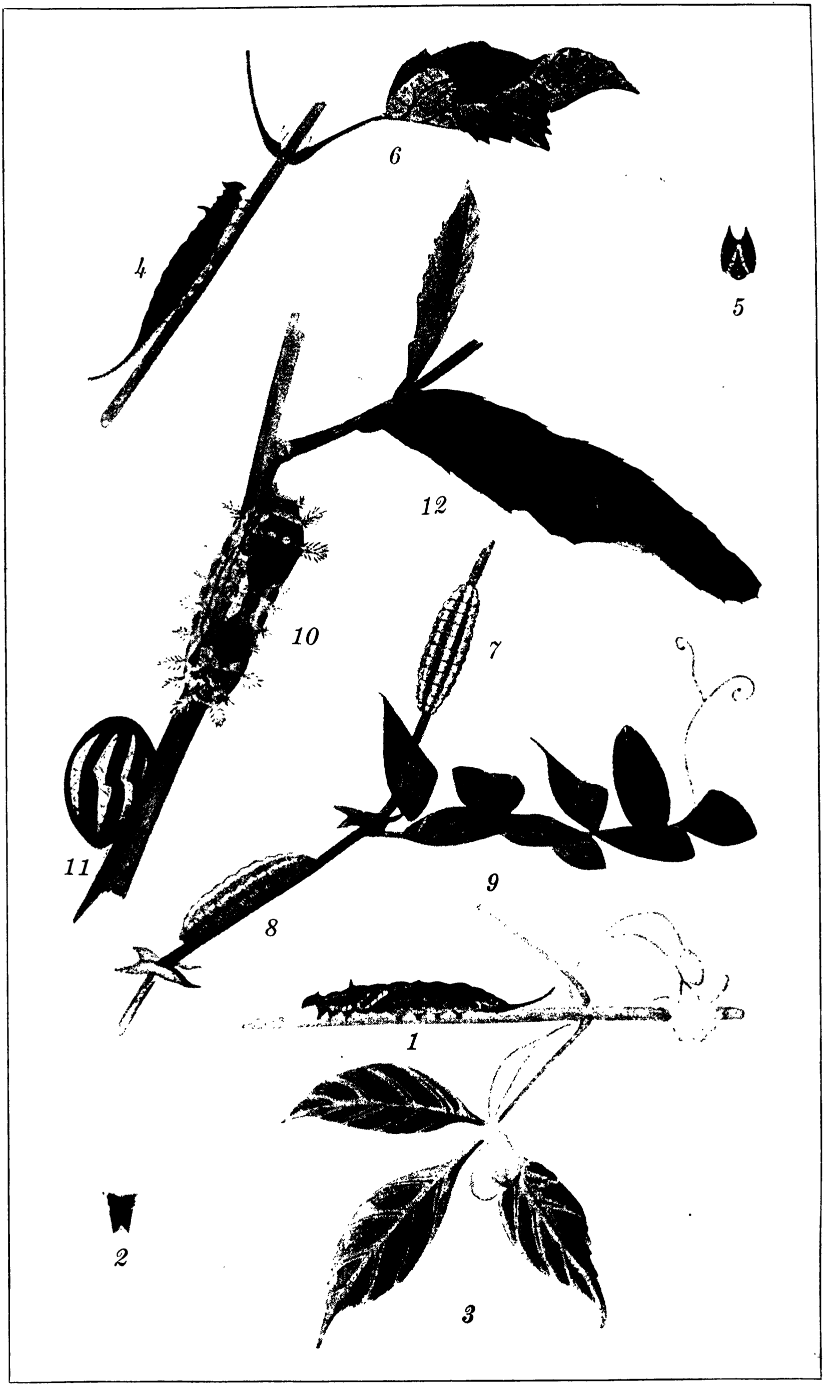

PLATE 1. JAPANESE LEPIDOPTERA.

UNIV. OF MICH.

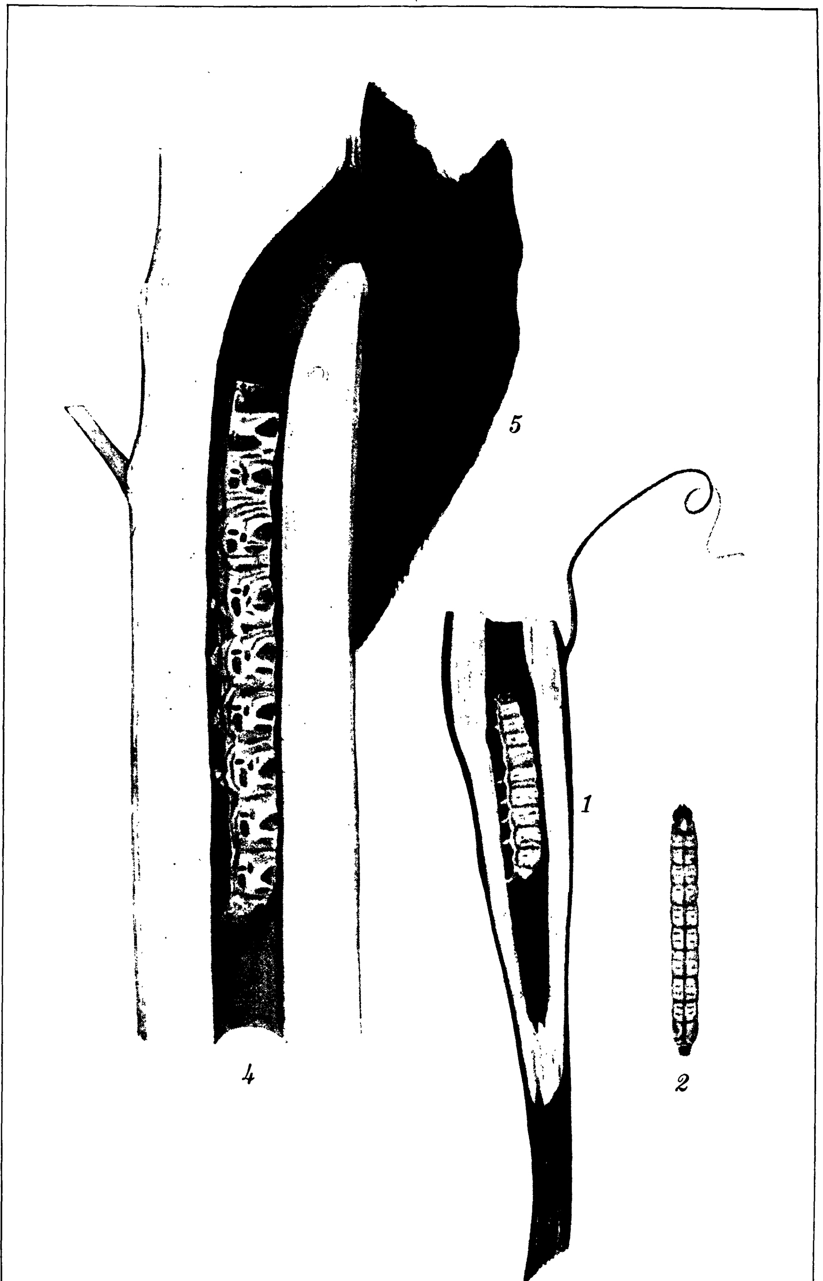

PLATE 2. JAPANESE LEPIDOPTERA.

UNIV. OF MICH.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, VIII

DIE GATTUNGEN ANISOCARA, SPILOSCAPHA, MENIMUS, LABIDOCERA, UND PENTAPHYLLUS

Von HANS GEBIEN

Hamburg, Deutschland

EINE TAFEL

Genus **ANISOCARA** novum

Von der Gestalt der schwarzen *Platydema*-Arten, oval, gewölbt, nackt.

Der Kopt ist in beiden Geschlechtern sehr verschieden, beim Männchen und Weibchen flach ausgehöhlt, beim Männchen vorn spitz und stark vorgezogen, der ganze Rand scharf aufgebogen, das Epistom mit Spitze versehen, zwischen den Augen befinden sich zwei ungleiche, aufrechte, nach hinten gerichtete Hörner. Die Augen sind gross, quer, von den Wangen weit durchsetzt, ihr oberer Teil ist schräg nach vorn gerichtet, beim Weibchen finden sich statt der Hörner scharfe Tuberkeln. Die Oberlippe ist sehr scharf quer gekielt, die Gelenkhaut ist deutlich. Die Fühler sind schlank, 11-gliedrig, Glied 3 ist zylindrisch, viel länger als 4, vom fünften an sind die Glieder erweitert, die Sinnesporen finden sich hauptsächlich an der Spitze der Glieder. Der Hals ist dick. Auf der Unterseite des Kopfes bleiben die Augen vom Maxillarausschnitt durch einen ziemlich breiten Zwischenraum getrennt. Dass Kinn ist so breit wie lang, leicht gewölbt, beim Männchen ohne Grube. Die Labialpalpen sind sehr klein, das Endglied der Maxillarpalpen ist dreieckig, die Mandibeln sind am Ende scharf und lang zweispitzig.

Der Halsschild ist in beiden Geschlechtern gleich, er ist sehr stark quer, alle Ecken sind kurz verrundet, an der Basis finden sich vier deutliche Grübchen statt der gewöhnlichen zwei.

Die Flügeldecken sind leicht gefurcht, die Epipleuren vollständig. Die Unterseite ist wie bei *Platydema* gebildet, das

Prosternum ist wagerecht und hat einen scharf senkrecht absturzenden Fortsatz, das Mesosternum ist V-förmig ausgeschnitten, der Abdominalfortsatz spitz, die beiden letzten Segmente sind an der Basis leicht quer gefurcht. Die Beine haben beim Männchen keine Auszeichnung, die Schenkel sind mässig dick, die Schienen gerade, aussen mit scharfer, aber sehr zart krenulierter Kante. Die Vordertarsen des Männchens haben keine erweiterten Glieder. Die Tarsen sind dünn und lang, an den hinteren ist Glied 1 etwas länger als 2 + 3.

Diese Gattung ist aufs nächste mit *Platydema* verwandt und könnte als recht abweichende Art aufgefasst werden, wenn nicht die höchst eigentümliche Kopfbildung des Männchens wäre. Das weit vorgezogene, spitze Epistom und das verlängerte dritte Fühlerglied sind Merkmale die sich bei *Platydema* nicht finden, wohl aber bei *Ischnodactylus,* von dem sich unsere Gattung durch stark gewölbten Körper, ganz andere Bewaffnung des Kopfes, beim Männchen nicht mit Grube versehenes Mentum, stark gerandeten Abdominalfortsatz unterscheidet. Die vier Grübchen an der Basis des Pronotums finden sich bei keiner mir bekannten Diaperiden-Gattung wieder.

Anisocara gynandromorpha sp. nov. Tafel 1, Fig. 1.

Oval, stark gewölbt, glänzend schwarzbraun, Fühler und Beine rotbraun. Der Kopf des Männchens ist breit, aber flach ausgehöhlt, der Vorderkopf lang spitzbogig vorgezogen, die Mitte des Epistoms mit Zähnchen versehen, der ganze Rand stark aufgebogen. Die Stirn ist vorn ungefähr 1.5 mal so breit wie ein Auge von oben gesehen, die Wangen sind viel schmäler als die Augen und engen sie bis über die Mitte ein, die Punktierung ist fein und regelmässig. Am Innenrand der Augen erheben sich zwei lange, schräg nach hinten gerichtete, also über den Vorderrand des Pronotums gelegte Hörner, die etwas divergieren: das linke ist wesentlich länger als das rechte, am Ende verrundet und dort mit Haarbekleidung versehen, das linke ist zuerst parallelseitig, verengt sich plötzlich spitz und hat keine Behaarung, beide Hörner sind kantig. Beim Weibchen ist der Vorderkopf über halbkreisförmig gerundet, die Ränder sind nicht deutlich aufgebogen, die Mitte des Epistoms ist leicht angedeutet, die Quernaht ist gut ausgeprägt, halbkreisförmig, die Stirn flach grubig vertieft, am Innenrand der Augen befinden sich zwei feine, spitze Tuberkeln. Die Fühler sind dünn, erreichen aber die Basis des Pronotums nicht. Der Halsschild ist stark quer, flach gewölbt, die Basis ist an den Hinterecken nicht vorgezogen, diese sind also rechteckig, aber verrundet, die Spitze ist von oben gesehen leicht ausgeschnitten, die Vorderecken sind sehr breit verrundet stumpfwinklig. An der Basis finden sich ausser den beiden gewöhnlichen länglichen Grübchen noch zwei weitere etwas mehr nach innen, beim Männchen davor auf der Scheibe noch zwei rundliche Eindrücke, die aber vielleicht individuell sind. Die Punktierung ist sehr deutlich, wenig dicht, gleichmässig.

Die Flügeldecken sind fein gefurcht, die Furchen werden hinten tiefer und gehen bis zur Spitze durch; die Punkte der Streifen sind ausserordentlich fein und dicht gedrängt, die Zwischenräume sind besonders hinten gewölbt, sehr fein punktiert und im Grunde mikroskopisch fein lederrunzlig. Die Decken sind stark gewölbt und fallen an den Seiten senkrecht, hoch ab, doch ist die Randkante von oben sichtbar. Unterseite und Beine sind in der Gattungsbeschreibung dargestellt.

Länge, 6.5 bis 7.5 Millimeter; Breite, 3.6 bis 4.

Ein Pärchen von Java Occidental, Pengalengan, 4,000 Fuss (*H. Fruhstorfer*), im Museum Dahlem.

Die Art ist durch die eigentümliche Kopfbildung des Männchens sehr ausgezeichnet, das Weibchen sieht einem *Platydema* sehr ähnlich, ist aber an dem Fühlerbau als eigene Gattung zu erkennen.

Genus **SPILOSCAPHA** Bates

Spiloscapha BATES, Entom. Monthly Mag. 9 (1873) 202.

Spiloscapha nigrofasciata sp. nov.

Oval, glänzend rotbraun, auf den Flügeldecken mit einem helleren Fleck hinter der Mitte der Basis und dahinter einer breiten, schwarzen Binde, auch die Fühlerglieder bis auf die ersten schwarz.

Kopf in der Längsrichtung schwach gewölbt, querüber flach. Augen weit getrennt, von den sehr schmalen Wangen bis zur Mitte oder etwas darüber geteilt. Der Vorderkopf ist stark und geradlinig verengt, die ganze Oberfläche sehr blank, fein und nicht dicht, etwas ungleich punktiert, die Ecken des Epistoms mit leichten Grübchen. Die Fühler werden zur Spitze dicker, Glied 1 bis 3 sind rotbraun, die andern schwarz. Glied 3 ist so breit wie lang, nicht zylindrisch; vom vierten an sind die Glieder allmählich stärker quer, die vorletzten sind 1.5 mal so breit wie lang, das elfte ist oval, viel länger als breit.

Der Halsschild ist an der Basis kaum doppelt so breit wie in der Mittellinie lang, die Seiten sind deutlich und ziemlich stark nach vorn gerundet verengt, die Seitenrandkehle ist mässig breit, von oben gesehen ragen die Vorderwinkel nicht vor, sie sind in der Randkante kurz verrundet rechtwinklig. Die Basis ist fast gerade abgestutzt, nur die Mitte ist leicht bogig vorgezogen. Die Punktierung ist sehr fein und nicht dicht.

Die Flügeldecken sind bunt (dreifarbig), doch sind die Farben nicht scharf begrenzt. Der helle Fleck hinter der Basis ist quer und hebt sich nur hinten gegen die schwarze Binde scharf ab; diese berührt den Seitenrand nicht, geht aber über beide Decken, den Nahtstreifen kaum heller lassend. Es sind scharf eingeschnittene, hinten sogar furchige Punktstreifen vorhanden, deren Punkte fein und rund sind. Die Zwischenräume sind vorn fast flach und mit ganz vereinzelten, kräftigen Punkten versehen. Bis zur Schulter sind alle Streifen entwickelt, daneben findet sich an der Seite, von der schwarzen Binde an, ein weiterer Streif.

Die Unterseite ist sehr fein punktiert, das Prosternum ganz wagerecht, hinten flach, halbkreisförmig verrundet, jederseits neben den Hüften äusserst fein gerandet; das Mesosternum liegt auch hinten etwas tiefer als das Metasternum und hat vorn eine starke Beule.

Länge, 3.8 Millimeter.

Zwei Exemplare von Singapore (*H. Ridley*) im Britischen Museum, von denen mir eines für meine Sammlung überlassen wurde.

Diese Art ist der *Spiloscapha javanicum* sehr ähnlich, aber anders gezeichnet, hat nicht vorragende Vorderecken des Pronotums und kräftig gefurchte Decken. Ausser diesen beiden Arten liegt mir eine dritte in einem einzelnen, defekten, unsauberen Exemplar von den Philippinen aus dem Britischen Museum vor, das ich nicht zu beschreiben wage. Sie ist der obigen Art täuschend ähnlich, hat aber nicht gefurchte Decken und etwas andere Zeichnung.

Spiloscapha javanicum sp. nov.

Körper schmal oval, rot, Oberseite mit schwarzen Flecken, glänzend, Unterseite, Beine, und die ersten drei Fühlerglieder rotgelb, die übrigen schwarz.

Der Kopf ist flach, auch an den Seiten, die Wangen sind also nicht aufgebogen, die Seiten des Vorderkopfes sind etwas nach aussen gebogen verengt, aber der Vorderkopf ist nicht halbkreisförmig, das Epistom ist in der Mitte gerade abgeschnitten, die Verbindungsnaht zwischen Epistom und Oberlippe ist breit. Die Punktierung ist dicht und sehr fein, aber deutlich. Die Wangen sind viel schmäler als die Augen. Die Fühler sind lang und dick. Glied 3 ist konisch, viel länger als dick, 4 und alle folgenden sind quer, die vorletzten reichlich 1.5 mal so breit wie lang, das letzte ist breit oval, länger als breit. Das Kinn ist flach, trapezisch, vorn kaum breiter als in der Mittellinie lang.

Der Halsschild ist 2.5 mal so breit wie lang, kräftig gewölbt, der Seitenrand ist gleichbreit, scharf abgesetzt verflacht, die Seitenrandkehle setzt sich in derjenigen der Flügeldecken fort, stösst aber winklig auf sie. Basis und Spitze sind ungerandet, der Vorderrand ist kräftig ausgeschnitten, die Ecken sind verrundet rechtwinklig, die hinteren scharf. Die Punktierung ist fein und mässig dicht, die basalen Grübchen sind rundlich, wenig auffällig. Die Farbe ist bei einem Exemplar rotgelb, bei dem andern findet sich jederseits ein grosser, dunkler Basalfleck.

Die Flügeldecken haben eine schmale, schwarze Basis und in oder hinter der Mitte eine breite, quere Binde, die aber hinten nicht begrenzt ist, sondern ganz verschwommen. Die Skulptur ist eigentümlich: der Nahtstreif ist hinten stark gefurcht, es sind nur die ersten fünf oder sechs Punktreihen ausgebildet, sie sind sehr fein, etwas unordentlich, Zwischenräume 3 und 5 sind vorn doppelt so breit wie 2 und 4, hinter der Mitte sind die Interstitien gleichbreit, ihre Punktierung ist doppelt, es finden sich etwas gröbere Punkte, die so stark sind wie die der Streifen und sehr viel feinere. Die Seiten der Decken sind ganz verworren punktiert. Die Epipleuren sind weit vor der Spitze verkürzt.

Die Unterseite ist fein und mässig eng punktiert, das Prosternum ganz wagerecht, vorn querüber breit verrundet, hinter den Hüften mit breitem, am Ende halbkreisförmigen Fortsatz. Das Mesosternum ist ziemlich scharfkantig, aber breit und flachbogig eingedrückt, der Abdominalfortsatz ist sehr breit, nicht gerandet, die Beine sind ziemlich lang, nicht ausgezeichnet. An den Hintertarsen ist Glied 1 etwas kürzer als der Rest.

Länge, 4 Millimeter.

Zwei Exemplare aus dem Museum Dahlem, von denen mir eines für meine Sammlung überlassen wurde.

Java Occidental, Pengalengan, 4,000 Fuss (*Fruhstorfer*).

Ich sehe keinen Grund diese und die vorige Art von der australischen Gattung zu trennen. Deren Verbreitung ist daher recht interessant. Aus dem papuanischen Gebiet, von woher mir ein reiches Material vorlag, ist mir keine Art bekannt. Unsere Art stimmt mit der australischen *Spiloscapha thalloides* nicht nur in allen Gattungscharakteren überein, sondern auch in Gestalt und Färbung, die nur wenig anders ist. Doch ist *javanicum* kleiner, anders gezeichnet, die ganze Basis der Decken ist schwarz, während bei *thalloides* nur jederseits des Schildchens sich ein Fleck findet, ferner ist die schwarze, hinten sehr schlecht begrenzte Binde in oder hinter der Mitte, bei der australischen Art vor der Mitte. Ganz abweichend ist die Skulptur der Decken: die paarig genäherten Punktreihen und die doppelte Punktierung der Zwischenräume.

Uebrigens ist die Gattung *Spiloscapha* dem *Scaphidema* ausserordentlich nahe verwandt und kaum generisch verschieden. Bates führt zahlreiche Unterschiede an, die aber fast ausnahmslos gradueller Natur sind. Es fehlt bei *Spiloscapha* die Metallfarbe, die Fühlerglieder sind schon vom vierten an erweitert, die Seiten des Halsschildes sind nicht trapezisch sondern gerundet, in der Endhälfte fast parallel.

Genus **MENIMUS** Sharp

Menimus SHARP, Ent. Monthly Mag. 13 (1876) 73.

Ebensowenig wie Lewis habe ich irgendwelche Zweifel dass die nachfolgenden asiatischen Arten in die sonst rein neu-seeländische Gattung *Menimus* zu stellen sind. Eine neue Art, leider nur ein Exemplar liegt mir aus dem Britischen Museum von Neu-Guinea vor. Nicht nur die äussere Aehnlichkeit ist sehr gross, auch in scheinbar nebensächlichen, artlichen Merkmalen und besonders in selten auftretenden Eigentümlichkeiten zeigt sich die generische Zusammengehörigkeit; so der feine Ausschnitt an den Hinterecken des Pronotums, die zottige Behaarung an den Tarsen, die Dörnchen auf deren Unterseite, die nur 10-gliedrigen Fühler, die winzigen Augen, etc. Fühler von zehn Gliedern hat unter den Diaperiden nur noch *Paita* Fauvel von Neu-Caledonien, eine Gattung die *Menimus* sehr ähnlich sein muss, aber bei ihr soll das erste Glied der Hintertarsen lang sein, länger als die beiden folgenden zusammen, und das Mesosternum ist stumpf vorgezogen, bei unserer Gattung liegt es tief zwischen den Hüften, ist schmal, rinnenförmig eingedrückt, und lässt die Hüften vorn frei.

Neue Beschreibung der Gattung.—Lang oval, oder parallelseitig, stark gewölbt, Unterflügel verkümmert oder (vermutlich bei mehreren neu-seeländischen Arten) fehlend. Der Kopf ist frei, sehr dick, in beiden Geschlechtern gleich; die Augen sind sehr klein, ganz an den Seiten liegend und meist etwas nach vorn gerichtet. Der Hals ist dick und setzt keine eigentliche Schläfe ab, die Quernaht vorn ist fein oder undeutlich, der Vorderkopf ist einfach verengt, das Epistom gerade abgestutzt oder ausgebuchtet, die Oberlippe ist ganz flach, sehr gross, eine Gelenkhaut zwischen ihr und dem Epistom fehlt, ebenso ein Querkiel. Die Fühler sind kurz und meist dick, 10-gliedrig, mit 3 bis 5-gliedriger Keule, sie sind lang behaart. Auf der Unterseite des Kopfes nehmen die Mundteile nur etwas mehr als ein Drittel der Breite ein, der Raum zwischen Auge und Maxillarausschnitt ist sehr breit. Das Mentum ist verschieden gebildet, bei den asiatischen Arten meist mit spitzer Tuberkel versehen, oder es ist gekielt oder (bei *niponicus*) ganz flach. Das Endglied der Maxillarpalpen ist dreieckig, das der Labialpalpen lang zylindrisch und spitz. Die Mandibeln sind an der Spitze ausgeschnitten. Der Halsschild ist an den Seiten (Ausnahme *niponicus*) mit breiter Randkehle versehen, die Hinterecken sind scharf rechtwinklig, aber ihre Spitze ist abgestutzt oder meistens sehr fein, winklig ausgeschnitten. Der Vorderrand ist gerade abgeschnitten oder in der Mitte leicht vorgezogen, die Basis ist ungerandet.

Das Schildchen ist quer dreieckig. Die Flügeldecken sind stark gewölbt, meist irregulär punktiert oder mit nicht gut und gleichmässig ausgebildeten Punktreihen. Die Epipleuren sind verkürzt.

Das Prosternum ist meist verlängert und spitz, zuweilen aber hinten etwas niedergedrückt und dann erst mit Spitze versehen. Das Mesosternum liegt sehr tief zwischen den Hüften, es ist schmal, der Eindruck geht bis an das Metasternum, die Mittelhüften sind sehr gross und daher vorn frei. Die Hinterbrust ist kürzer als der Durchmesser einer Hüfte. Die bei den Tenebrioniden gewöhnliche Querfurche vor den Hinterhüften ist sehr zart. Der Abdominalfortsatz ist breit, die Gelenkhaut zwischen den letzten Segmenten ist deutlich. Die Beine sind mässig lang, die Schenkel ziemlich dünn, die Schienen gerade, in beiden Geschlechtern gleich, hinten nicht mit feiner, krenulierte Kante versehen. Die Tarsen sind sehr lang behaart, die vorderen und mittleren auf der Sohle gewöhnlich mit Dörnchen versehen, an den Hintertarsen ist das erste Glied kürzer als das Klauenglied.

Herr Blair, der mir zwei Stücke der neuen Art *M. blairi* aus Neu-Guinea mitteilte, bezeichnete sie als *Enanea* Lewis spec. und bemerkt brieflich, dass *Enanea* sich von *Menimus* durch 1-gliedrige Fühlerkeule unterscheide. Durch diese Notiz erst wurde ich auf die Gattung *Enanea* aufmerksam gemacht, die mir in Natur unbekannt ist. Der Autor stellt sie zu den Ulomiden. Leider übergeht die Beschreibung, wie bei fast allen seinen Tenebrioniden-Gattungen, die wesentlichen Merkmale. Ich habe aber keinen Zweifel dass der sorgfältig beobachtende Blair sie richtig identifiziert. Aber in einem Merkmal weicht *Enanea* sicher von *Menimus* ab: sie hat spitz dreieckig aufgebogene Wangen beim Männchen, auch ist die Fühlerkeule nicht deutlich abgesetzt. Wegen des ersteren Merkmals zögere ich *Enanea* mit *Menimus* zu vereinigen. Was die Bildung der Fühlerkeule betrifft, so scheint mir dieses Merkmal nicht ausreichend die Gattungen zu trennen, denn bei den neu-seeländischen Arten sind nicht immer drei gut abgesetzte Glieder vorhanden und die unten neu aufgeführten Arten schwanken gerade in der Fühlerbildung sehr. Auch die Ausrandung des Epistoms, die oftmals stark, dann schwächer ist und bei andern Arten fehlt, darf kaum als Gattungscharakter angesehen werden. Würde ich Fühler- und Epistombildung zur Aufstellung neuer Gattungen benutzen, so würden wir eine Anzahl sehr artenarmer Gattungen haben, die in dem einen Hauptmerkmal, den 10-gliedrigen Fühlern, übereinstimmen, das sie von allen andern gut scheidet. Ich glaube aber dass wir uns vorläufig mit den beiden Gattungen (zu denen *Paita* von Neu-Caledonien als dritte kommt) begnügen, bis die Entdeckung von zahlreichen neuen Arten es wünschenswert erscheinen lässt, eine weitere Trennung vorzunehmen.

Uebersicht über die asiatischen Arten von Menimus Sharp.

1. Halsschild an den Seiten gerundet, Körper etwas parallelseitig, Flügeldecken einfarbig braun, ohne Spur von Metallschimmer................ 2.
   Halsschild trapezisch, Seiten gerade, Körper oval, nach hinten erweitert, Flügeldecken deutlich metallisch. Vorderindische Arten...................... 5.
2. Länge, 2.25 Millimeter, Hinterkörper sehr stark gewölbt, Seitenrand der Decken von oben nur ganz vorn sichtbar, Halsschild grob punktiert, Mentum quer, ganz flach. (Japan.)........................ **M. niponicus Lewis.**

Drei Millimeter und grösser, ganz parallel, Seitenrand der Decken mindestens in der Vorderhälfte sichtbar, Halsschild fein punktiert, Mentum gewölbt oder mit starker Tuberkel .... 3.

3. Sechs Millimeter und grösser, Pronotum oben rauh, besonders beim Männchen, Fühlerkeule mit schwach queren Gliedern, lang. (Ceylon.) **M. rugicollis sp. nov.**

Drei bis 4.5 Millimeter gross, Pronotum oben glatt, fein punktiert, Fühlerkeule mit stark queren Gliedern .... 4.

4. Drei Millimeter lang, hellbraun, Epistom in tiefem Bogen ausgeschnitten, die Clypealsutur leicht eingedrückt. (Philippinen; Neu-Guinea.) **M. blairi sp. nov.**

Vier bis 4.5 Millimeter lang, schwarzbraun, Epistom in flacherem Bogen ausgeschnitten, die Clypealsutur leicht erhaben. (Java.) **M. kraepelini sp. nov.**

5. Hinterkörper sehr stark gewölbt, sein Seitenrand von oben nur dicht hinter der Schulter sichtbar, Halsschild nicht mit lederartiger Grundskulptur .... **M. indicus sp. nov.**

Hinterkörper flacher, sein Seitenrand von oben bis zur Mitte sichtbar, Halsschild mit lederartiger Grundskulptur .... 6.

6. Fühler mit 4-gliedriger Keule, Kinn mit deutlichem Längskiel, Hinterecken des Halsschildes mit kleinem, scharfwinkligem Ausschnitt. **M. ovalis** Allard.

Fühler mit 5-gliedriger Keule, Kinn mit Höcker, die Ecken des Halsschildes sind abgeschnitten .... **M. caraboides** Allard.

Menimus niponicus Lewis.

Menimus niponicus LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 398.

Zur Beschreibung des Autors füge ich nach dem einzigen mir vorliegenden Exemplar (Cotype!) einige Ergänzungen hinzu:

Die Augen sind sehr klein und ragen seitlich kaum aus der Wölbung des Kopfes, die Wangen sind nicht wie bei *kraepelini*, zum Beispiel, zuerst parallel und dick, sondern geradlinig bis zum Vorderrand des Kopfes verengt; das Epistom ist nicht ausgeschnitten, sondern gerade abgestutzt. Der Halsschild ist gleichmässig und sehr stark gewölbt, die Seitenrandkehle ist viel schmäler als bei den andern Arten, der Hinterrand ist von Ecke zu Ecke in sehr breitem Bogen stark nach hinten gezogen, also nicht gerade abgestutzt; auch der Vorderrand ist vorgezogen, er hat keine Randlinie, die Vorderecken sind kurz verrundet rechtwinklig, der Einschnitt der Hinterecken ist sehr schwach und undeutlich. Die Punktierung ist wie die des Kopfes grob und sehr vereinzelt. Die Flügeldecken sind in beiden Richtungen stark gewölbt, der Seitenrand ist von oben nur dicht hinter der Schulter zu sehen. Das Kinn ist ganz flach, ohne Tuberkeln, stark quer. Dornen an den Tarsen konnte ich ohne mikroskopisches Präparat nicht erkennen; ich wollte aber das einzige mir vorliegende Exemplar nicht zerlegen.

Länge, 2.25 Millimeter.

Japan.

Durch die geringe Grösse, das nicht ausgerandete Epistom, das ganz flache, stark quere Kinn, die sehr grobe Punktierung, den hinten in starkem Bogen vorgezogenen Halsschild von den andern mir bekannten Arten verschieden.

Menimus kraepelini sp. nov.

Ziemlich parallelseitig, glänzend dunkelbraun, stark gewölbt.

Der Kopf ist dick, in der Mitte flach, an den Seiten gewölbt, die winzigen Augen sind kreisrund, nach aussen fast halbkugelförmig gewölbt, die Wangen sind zuerst parallelseitig und liegen vor der Mitte der Augen, sie sind sehr dick. Die Punktierung ist weitläufig und ziemlich grob, ungleichmässig, vorn am Epistom grob und etwas runzlig. Die Gegend der Quernacht ist leicht erhöht, sie selbst ist nur in der Mitte angedeutet; von den Wangen an ist der Vorderkopf geradlinig stark verengt, und hat an den Seiten, ungefähr in der Mitte, einen winzigen Einschnitt. Das Epistom ist in breitem Bogen sehr sanft ausgeschnitten, die Ecken ragen nur schwach und undeutlich, nicht lappenartig vor. Die Fühler sind sehr kurz, die Glieder eng geschlossen, Glied 3 ist so breit wei lang, 4 schwach quer, 5 etwas stärker, 6 ist 1.5 mal so breit wie lang, die letzten vier bilden eine gut abgesetzte Keule, 7 bis 9 sind 2.5 mal so breit wie lang. Das Kinn ist quadratisch und hat eine sehr hohe, glänzende, runde, oben mit winzigem Porenpunkt versehene Tuberkel.

Der Halsschild ist ungefähr 1.5 mal so breit wie lang, querüber sehr stark gewölbt. Die Seitenrandkehle ist breit, nach vorn etwas verschmälert. Der Vorderrand ist fast gerade abgestutzt, in der Mitte nur ganz leicht vorgezogen, die Randlinie ist dort vollständig; der Hinterrand ist beinahe gerade abgeschnitten, die Hinterecken sind scharf rechtwinklig, sehr fein ausgeschnitten, die Seitenrandkante ist äusserst leicht gekerbt, die grösste Breite liegt eben hinter der Mitte, von dort sind die Seiten nach hinten schwach, nach vorn stark verengt. Die Punktierung ist sehr fein, wenig eng, gleichmässig, viel feiner als die des Kopfes, der Grund ist mikroskopisch fein lederrunzlig, aber glänzend.

Die Flügeldecken sind stark gewölbt, besonders hinten, die Seitenrandkante ist nur in der ersten Hälfte von oben sichtbar.

Die Decken sind fast parallel, von vorn bis zur Mitte nur ganz schwach erweitert, die Punktreihen sind nur in der Vorderhälfte deutlich, die Punkte ziemlich grob, nicht ganz gleichmässig, von der Mitte an allmählich erloschen. Die Zwischenräume sind flach, mit einzelnen, zum Teil in Reihen gestellten, etwas feineren Punkten besetzt.

Das Prosternum ist vorn querüber in starkem Bogen gewölbt, hinten gesenkt und mit Spitze versehen, also nicht, wie bei den andern Arten, wagerecht. Das Mesosternum ist wie gewöhnlich rinnig vertieft und liegt tief zwischen den Hüften, ist also sehr schmal und bis zur Hinterbrust eingedrückt, die Mittelhüften sind vorn ganz frei. Die Beine sind dick, die Sohlen haben die normalen kleinen Zäpfchen, sie sind sehr klein und meist in der langen Behaarung versteckt.

Länge, 4.1 bis 4.4 Millimeter; Breite, 2.1 bis 2.2.

Fünf Exemplare in den Sammlungen Hamburg, Gebien, Veth.

Java, Preanger (*Sijthoff*); Tjibodas, 25ten bis 28ten März, 1904 (*Kraepelin*).

Diese Art unterscheidet sich von denen des indischen Festlandes durch den nicht trapezischen Halsschild und die nicht metallischen Decken, kürzere Fühler, und mehr ausgebildete Punktstreifen, ferner durch das nicht wagerechte Prosternum. Sie ist neben *rugicollis* zu stellen, die aber über 6 Millimeter gross ist, durch eigentümliche Halsschildskulptur und ganz andere Fühler ausgezeichnet ist.

Menimus blairi sp. nov.

Sehr klein, parallelseitig, glänzend hellbraun, nackt.

Der Kopf ist sehr gross, flach, die Augen sind winzig klein, nach vorn gerichtet; die sehr langen Schläfen sind so dick wie die Augen und bestimmen deren Richtung. Die Wangen treffen in der Mitte auf die Augen, sie sind stark gewölbt, von ihnen an ist der Vorderkopf stark, geradlinig, ohne sichtbaren Einschnitt verengt. Die Quernaht ist nicht erhöht, sondern sehr fein eingedrückt. Das Epistom ist in starkem Bogen ausgeschnitten, sein Rand läuft der Quernaht parallel und wird von einer Reihe gröberer Punkte begleitet; sonst ist die Punktierung ziemlich fein. Die Fühler sind kurz und haben eine geschlossene, 4-gliedrige Keule von stark queren Gliedern, Glied 3 ist so lang wie breit.

Der Halsschild ist querüber stark gewölbt, ungefähr doppelt so breit wie in der Mittellinie lang, die Basis ist fast gerade abgestutzt, die Mitte des Vorderrandes sehr leicht vorgezogen, die Seitenrandkehle ist nach vorn verschmälert, im übrigen dick, die äusserste Randkante ist kaum wahrnehmbar fein krenuliert. Die Punktierung ist fein und weitläufig.

Die Flügeldecken sind parallelseitig, stark gewölbt, die Seitenrandkante ist von oben sichtbar, sie ist ausserordentlich fein gesägt (durch fein eingedrückte Borstenpünktchen). Es sind Reihen ziemlich grober Punkte vorhanden, nur der Seitenabsturz ist irregulär punktiert. Die Zwischenräume sind ganz flach und mit einzelnen Punkten besetzt, ebenso gross wie die der Reihen.

Das Prosternum ist zwischen den Hüften sehr schmal, liegt etwas vertieft und ist hinten ganz niedergedrückt. Auf der Unterseite des Kopfes hinter den Augen befindet sich eine Gruppe grober Punkte. Die Mittelbrust liegt ganz vertieft. Das Abdomen ist entweder mit einzelnen groben Punkten besetzt und sehr deutlich lederrunzlig, oder (bei den Tieren von Tacloban) fast glatt. Das Analsegment ist querüber leicht vertieft und mit einzelnen gröberen Punkten versehen. Die Zäpfchen an den Sohlen sind kaum sichtbar.

Länge, 3 bis 3.2 Millimeter.

Sieben Exemplare. Philippinen: Leyte, Tacloban; Luzon, Laguna; Paete (*W. Schultze*). Ferner Neu-Guinea, Misol, aus dem Britischen Museum, ex coll. Pascoe und coll. Sharp.

In den Sammlungen London, Schultze, und Gebien.

Die sehr kleinen, leider nicht ganz sauberen, auf Karton geklebten Tiere machten eine Untersuchung der Unterseite schwer. Es ist also nicht ausgeschlossen, dass die Tiere so verschiedener Herkunft sich doch als verschiedene Arten ausweisen. Die Tiere von Tacloban, auch die von Misol, haben eine scharfe Tuberkel auf dem Mentum, während die Stücke von Paete ein sanft gewölbtes und jederseits leicht grubig vertieftes Kinn haben, ferner zeigen die ersteren einige grobe Punkte auf dem Abdomen, die andern nicht. Da im übrigen die Tiere in allen Hauptmerkmalen übereinstimmen (dem tief bogig ausgeschnittenen Epistom, der Fühlerbildung, der Skulptur, der parallelseitigen Form, dem niedergedrückten Prosternum), so lasse ich sie als Angehörige einer variablen Art gelten.

Unsere Art hat unter den Asiaten als nächsten Verwandten den *M. kraepelini* aus Java, ist aber viel kleiner, hellbraun, und hat ein tief ausgeschnittenes Epistom, ferner nicht eine leicht erhöhte Clypealsutur. Auf den ersten Blick noch ähnlicher ist eine neue Art von den Philippinen, die mir in einem Einzelstück aus dem Britischen Museum vorliegt. Sie entfernt sich aber weit durch winziges Mentum, stark schräge abgeschnittene Glieder der Keule, gerade abgestutztes Epistom, fast gefurchte Flügeldecken, und sehr breite, vorn nicht verschmälerte Randkante des Pronotums. *Menimus niponicus* aus Japan ist noch kleiner, mehr oval, hat grob punktierten Halsschild, queres Mentum, gerade abgestutztes Epistom, und wagerechtes Prosternum.

Menimus rugicollis sp. nov. Tafel 1, Fig. 2.

Lang oval, fast parallelseitig, mässig gewölbt, glänzend braun, nackt.

Der Kopf ist sehr gross und dick, hinter den Schläfen sehr schwach eingeengt. Die Augen sind sehr klein, liegen ganz an den Seiten und sind nach unten sehr schwach ausgezogen, sie werden durch die Wangen nicht eingeengt. Diese sind etwas schmäler als die Augen, dick, von dort ist der Vorderkopf stark und einfach verengt, die Ecken des Epistoms sind scharf, der Vorderrand ist in breitem Bogen ausgerandet. Die Quernaht ist sehr fein, aber nicht eingedrückt, sondern dort ist der Kopf etwas erhaben. Die Stirn ist flach, stark, etwas länglich, nicht eng punktiert, vorn auf der Wölbung gerunzelt. Die Oberlippe ist gross, ganz flach, und mit dem Epistom nicht durch eine Gelenkhaut verbunden. Die Fühler sind dick und kurz, lang behaart, Glied 2 ist ziemlich viel kürzer als 3, 3 gleicht 4, 5 ist so breit wie lang, 6 ist schwach quer, die letzten vier sind deutlicher quer, eine Keule ist also nicht gut abgesetzt. Auf der Unterseite sind die Mundteile von den Augen durch einen Zwischenraum abgesetzt, der fast so breit ist wie die Mittelpartie. Das Kinn ist quer, trapezisch, mit einer sehr hohen, spitzen Tuberkel versehen. Das Endglied der Labialpalpen ist sehr lang zylindrisch, das der Maxillarpalpen dreieckig, diese Palpen sind auf dem Grundteil mit einzelnen, langen Haaren versehen.

Der Halsschild ist ungefähr 1.5 mal so breit wie lang, an den Seiten kräftig gewölbt, oben etwas flachgedrückt, die Mittellinie ist leicht eingedrückt, die Punktierung wenig eng, sehr deutlich, die Scheibe beim Weibchen schwach, beim Männchen stark gerunzelt, die Runzeln sind erhaben, verworren, kurz. Die grösste Breite liegt ungefähr in der Mitte, nach hinten sind die Seiten schwach, nach vorn stärker verengt, die Seitenrandkante ist breit, der äusserste Rand sehr leicht uneben. Die Hinterecken sind kurz abgeschnitten, nicht mit deutlichem Ausschnitt versehen, die vorderen sind kurz verrundet. Das Schildchen ist breit dreieckig.

Die Flügeldecken sind parallelseitig, sie haben einige deutliche Punktreihen, aber nur auf der Scheibe, während die seitlichen undeutlich sind, die Zwischenräume sind ganz flach und ebenso grob und weitläufig punktiert wie die Streifen. Die Epipleuren sind vor der Spitze verkürzt.

Die Unterseite zeigt einzelne kurze Haare. Prosternum und Mesosternum sind zwischen den Hüften sehr schmal, das erstere ist vorn etwas, hinten mehr gesenkt, dann wagerecht, die Spitze ist prononziert. Die Hüften liegen höher als das Prosternum. Das Mesosternum ist bis zum Metasternum eingedrückt und liegt ganz vertieft. Die Propleuren sind nur ganz hinten leicht ausgehöhlt. Die Hinterbrust ist zwischen den Hüften kürzer als der Durchmesser einer Hüfte. Das Abdomen ist kräftig und etwas rauh, nicht eng punktiert. Die Schenkel sind ziemlich dick, die Schienen gerade, die Tarsen kurz, die vorderen und mittleren mit sehr langen, zarten Haaren besetzt. Auf der Unterseite sind die ersten vier Tarsenglieder in einen spitzen Zapfen ausgezogen, der sich unter das folgende Glied schiebt, wodurch die Glieder ganz schräge abgeschnitten erscheinen.

Länge, 6 bis 6.6 Millimeter.

Zwei Männchen, 2 Weibchen, von Ceylon (*Nietner*) im Museum Stettin und in meiner Sammlung.

Dies dürfte die grösste Art der Gattung sein. Sie ist von allen mir bekannten Arten durch den Sexuel-Dimorphismus auf dem Pronotum verschieden, von den nächsten drei Arten durch den parallelen Körper und den nicht trapezischen Thorax. Am nächsten steht M. *kraepelini,* ist aber viel kleiner, hat ganz andere Skulptur des Pronotums und anderen Fühlerbau.

Menimus ovalis Allard. Tafel 1, Fig. 3.

Chariotheca ovalis ALLARD, Naturaliste (1894) 104.

Oval, ziemlich flach, glänzend braun, Flügeldecken deutlich metallisch, Fühler und Beine rötlich.

Der Kopf ist gross, vorn beim Beginn des Epistoms deutlich gewölbt, die Quernaht ist nur bei starker Vergrösserung als feine, glänzende Linie sichtbar. Die Wangen sind sehr dick, aber viel schmäler als die Augen. Die Punktierung ist ziemlich fein, das Epistom hat rundlich vorgezogene Ecken. Die Fühler sind schlank, die ersten fünf Glieder dünn, 3 ist länger als 4, 4 and 5 sind gleich gross, 6 ist etwas grösser, so breit wie lang, die letzten vier bilden eine gut abgesetzte Keule von grossen Gliedern, die aber nur wenig quer sind. Das Kinn hat einen leichten

Mittelkiel und jederseits ein Grübchen, aber keinen Zapfen. Der Unterkopf hinter den Mundteilen ist querüber leicht vertieft.

Der Halsschild ist genau trapezisch, die Seiten sind von der Basis an geradlinig verengt; die Seitenrandkehle ist stark, die Spitze ist fast gerade abgestutzt, nur ihre Mitte ist leicht rundlich vorgezogen, die Basis ist gerade; die Hinterecken sind in der Breite der Randkehle ziemlich scharfwinklig ausgeschnitten. Die Punktierung ist sehr fein, wenig eng, und hat einzelne gröbere Zwischenpunkte, der Grund ist mikroskopisch fein lederrunzlig.

Die Flügeldecken sind verhältnismässig flach, so dass die Seitenrandkante von oben fast vollständig übersehbar ist, ausnahmsweise (ein Weibchen) sind die Seiten der Endhälfte überdeckt. Nur die inneren drei bis fünf Punktreihen sind auf der Scheibe deutlich, die äusseren in der gröberen Punktierung der Zwischenräume ganz geschwunden; auch hinten sind keine Punktreihen ausgebildet.

Das Prosternum ist ganz wagerecht und hat einen sehr langen, spitzen Fortsatz, es ist oben ungerandet. Die Mittelbrust ist bis zur Hinterbrust eingedrückt, so dass die Vorderseite der Hüften freiliegt. Die Beine sind dünn, die Zapfen an den Sohlen der vorderen Beinpaare sind sehr klein, die Behaarung ist lang.

Länge, 5.2 bis 5.9 Millimeter; Breite, 2.3 bis 3.

Sieben Exemplare in den Sammlungen Dahlem und Gebien.

Südindien: Trichinopoly; Madura; Shembaganur; Khasias.

Die Auffassung dieser Art als die *Chariotheca ovalis* Allard bedarf der Rechtfertigung. Dass der Autor diese oder die nächste Art bei der Beschreibung vor sich gehabt hat bezweifle ich nicht; dem widerspricht nur die Bemerkung dass sieben deutliche Streifen vorhanden seien, bei meinen Tieren sind zwar die äusseren Punkte hin und wieder reihig angeordnet, aber eigentliche Punktlinien sind nicht entwickelt. Uebrigens könnte Allard's *C. caraboides* auf unsere Art gedeutet werden. Dass der Verfasser von elf Fühlergliedern spricht darf nicht wundernehmen. Er wird überhaupt nicht gezählt haben und rechnet daher vom elften Gliede an rückwärts, weil aber die meisten Tenebrioniden elf Glieder haben. Solche Flüchtigkeit ist bei ihm nicht selten. Ich erinnere an *Ischnodactylus.* Hier gibt er in der Gattungsbeschreibung zehn Glieder an und bei seiner Art *I. batesi* zwölf Glieder. Es sind aber stets elf Glieder vorhanden. Noch unglaublicher klingt es dass Allard eine echte

Chrysomela als Tenebrionide beschreibt, nämlich als *Diphyrrhynchus*.[1] Ich habe mich für die vorliegende Art und nicht für die folgende entschieden weil Allard von vier ausgebildeten Punktstreifen spricht. Ein endgültiger Entscheid kann nur nach Konsultation der Typen erfolgen.

Menimus caraboides Allard.

Chariotheca caraboides ALLARD, Naturaliste (1894) 104.

Auf diese Art deute ich ein Exemplar meiner Sammlung von Madura, Südindien. Sie ist der vorigen Art täuschend ähnlich, so dass auf eine ausführliche Beschreibung verzichtet werden kann; sie unterscheidet sich aber sicher durch ganz anderen Fühlerbau: die letzten fünf Glieder bilden eine gut abgesetzte Keule, das Kinn hat statt des niedrigen Längskieles einen scharfen Höcker, die Hinterecken des Halsschildes sind nicht kurz ausgeschnitten, sondern sehr kurz schräg abgestutzt, die Dornen auf der Sohle der vorderen Tarsen sind ganz undeutlich.

Länge, 5.6 Millimeter; Breite, 2.7.

Menimus indicus sp. nov.

Sehr kurz oval, hinten sehr stark gewölbt, glänzend braun, die Flügeldecken metallisch.

Der Kopf ist sehr dick, in der Längsrichtung leicht gewölbt, eine Quernaht ist auch unter starker Vergrösserung nicht zu erkennen, die Augen sind wie bei den vorhergehenden beiden Arten schräg nach vorn and zur Seite gerichtet, klein, rund, die sehr dicken Wangen sind viel schmäler als die Augen. Die Punktierung ist sehr fein, vorn, besonders auf dem Clypeus, befinden sich einige grobe Punkte; die Ecken des Epistoms ragen leicht und kurz lappenförmig vor. Die Fühler sind kurz, Glied 4 ist kugelig, 5 etwas quer, die letzten fünf Glieder bilden eine gut abgesetzte Keule, deren Glieder stark quer sind, doch ist das erste Glied der Keule kleiner als die folgenden. Das Kinn hat keine Tuberkel, sondern ist vorn sehr stark gewölbt, und hat einen feinen Mittelkiel, daneben keine eigentlichen Grübchen.

Der Halsschild ist trapezisch; die Seitenrandkehle ist breit, vorn aber verschmälert. Die Hinterecken sind sehr kurz, winklig ausgeschnitten; der Grund des Halsschildes ist nicht wie bei den beiden vorhergehenden Arten mikroskopisch lederrunzlig, sondern glatt, er ist äusserst fein punktiert, und ausserdem sind einige gröbere Punkte vorhanden. Auf der Scheibe finden sich zwei flache Grübchen; die Vorderecken sind kurz verrundet stumpfwinklig, die Mitte des Vorderrandes ist ganz leicht vorgezogen.

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[1] Lesne, Bull. Soc. Ent. Fr.

Die Flügeldecken sind in der Mitte am breitesten, von dort ist der Seitenrand des Körpers bis zu den Vorderecken des Halsschildes geradlinig verengt. Der Hinterkörper ist so stark gewölbt dass die Seitenrandkante nur dicht hinter der Schulter von oben sichtbar ist. Nur die ersten Punktreihen sind erkennbar, der ganze seitliche Teil der Decken ist verworren punktiert.

Der Prosternalfortsatz ist sehr lang und spitz, das ganze Prosternum wagerecht, der Eindruck des Mesosternums reicht wie gewöhnlich bis zum Metasternum und ist furchig vertieft, die Hüften liegen vorn bloss. Die Beine sind länger als bei der vorigen Art.

Länge, 5 Millimeter; Breite, 2.6.

Ein Exemplar in meiner Sammlung (von Staudinger und Bang-Haas erworben).

Indien, Madras.

Diese Art bildet mit den beiden vorhergehenden Arten eine besondere Gruppe in der Gattung, ausgezeichnet durch den trapezischen Halsschild und die metallische Flügeldecken. Von *ovalis* unterscheidet sich *indicus* durch sehr stark gewölbten Hinterkörper, dessen Seitenrandkante nur ganz vorn von oben sichtbar ist, durch ganz andern Fühlerbau, nicht lederartige Grundskulptur des Pronotums, und kürzere Beine. Von *caraboides*, der ähnliche Fühler hat, unterscheidet sich unsere Art durch den stark gewölbten Hinterkörper, das nicht mit Zäpfchen versehene Kinn, und den nicht mit lederartiger Grundskulptur versehenen Halsschild.

Genus **LABIDOCERA** novum

Geflügelt, Hinterkörper parallel, kurz, gelbbraun, ganzer Leib behaart.

Der Kopf ist sehr gross, beim Männchen sanft eingedrückt, beim Weibchen flach, die Augen sind winzig klein, durch die Wangen nicht eingeengt, rund, die Schläfen liegen hinten plattenförmig an und richten die Augen nach vorn, diese sind fein fazettiert. Die Fühler sind höchst eigenartig, 11-gliedrig, das erste Glied ist ausserordentlich gross, beim Weibchen schräge abgeschnitten, beim Männchen so lang wie der Kopf, am Ende hakenförmig nach innen gebogen, und die folgenden Glieder setzen sich an der Seite des ersten Gliedes an, etwa in der

Mitte, es ist eine starke, aber nicht plötzlich abgesetzte Keule vorhanden, das zweite Glied ist dicker als das dritte, dieses ist beim Männchen kugelig, beim Weibchen länglich, zylindrisch, die vorletzten Glieder sind sehr stark quer, das letzte hat eine blanke Basis von halber Gliedlänge und eine etwas dreieckige, matte Spitze. Die Oberlippe ist winzig klein, nicht durch eine Gelenkhaut mit dem Epistom verbunden. Auf der Unterseite des Kopfes ist zwischen Auge und Maxille ein Raum breiter als der Mundausschnitt. Das Kinn ist quer, flach, die Maxillarpalpen haben ein stark beilförmiges letztes Glied, das Endglied der Labialpalpen ist spindelförmig. Die Mandibeln sind am Ende kurz ausgeschnitten.

Der Halsschild ist sehr stark quer, beim Weibchen so breit, beim Männchen breiter als die Flügeldecken. Die Basis ist ungerandet, alle Ecken sind breit verrundet, der Vorderrand ist gerade abgeschnitten. Das Schildchen ist an den Seiten parallel, das Ende halbkreisförmig verrundet.

Die Flügeldecken sind parallelseitig, stark gewölbt, verworren punktiert, die Epipleuren sind vollständig, aber an der Spitze sehr schmal.

Das Prosternum ist sehr schmal, hinten wagerecht, die Vorderhüften sind deutlich quer, schräg nach vorn gerichtet, die Vorderhüfthöhlen sind hinten offen. Die Mittelbrust ist sehr lang, flach, ohne Ausschnitt zwischen den Hüften, dort viel tiefer liegend als diese, und sehr schmal. Das Metasternum ist nicht länger als der Durchmesser einer Hüfte, die Gelenkhöhlen der Mittelhüften sind an den Seiten offen und haben einen winzigen Trochantinus. Die Hinterbrust ist hinten fein gerandet, der Abdominalfortsatz ziemlich schmal und mässig spitz, die Gelenkhaut zwischen den letzten Segmenten ist deutlich. Die Schenkel sind sehr dick und kurz, unten tief ausgehöhlt, die Vorderkante ist schneidig scharf, höher als die hintere. Die Schienen sind gerade, sie haben sämtlich eine Aussenendecke. Die Tarsen sind zart.

Diese neue Gattung ist von hohem Interesse. Die Bildung der Vorderbrust, das heisst, die hinten offenen Vorderhüfthöhlen, ist ein Charakter von grossem systematischen Wert. Man kannte jahrzehntelang nur eine Tenebrioniden-Gattung welcher dieses Merkmal zukommt, nämlich *Boros,* die eben wegen dieser Eigentümlichkeit von mehreren Autoren von den Tenebrioniden abgetrennt wurde; Thomson stellte sie zu den *Pythiden.* Alle neuren Systematiker möchten aber in *Boros* nur eine aberrante

Tenebrioniden-Gattung sehen. Später hat Winkler noch die blinde Tenebrioniden-Gattung *Osphyoplesius* aufgefunden, die ebenfalls hinten offene Vorderhüfthöhlen hat. Ich glaube dass bei sorgfältiger Durchsicht der exotischen Gattungen sich noch mehr Gattungen finden werden. Mir sind jetzt die folgenden Gattungen bekannt: *Boros, Osphyoplesius, Aposyla, Tanylipa, Labidocera,* ferner eine neue Helopiden-Gattung *Catamoneurus,* Reitter (in litt.), ausserden die ganze Unterfamilie der Erodiinen, ferner die Cryptochilinen. Einige Bemerkungen zu diesen Tieren dürften nicht überflüssig sein. Bei den Erodiinen ist das Merkmal der offenen Gelenkhöhlen nicht auffällig, denn bei ihnen ist eine weitgehende Verschmelzung des Skelettes eingetreten, so dass das Prosternum von dem Mesosternum nicht abgebogen werden kann; vermutlich haben daher die älteren Autoren geglaubt dass unterhalb der Trennungsnaht zwischen Prosternum und Mesosternum sich ein Abschluss der Hüfthöhlen finden würde, was nicht der Fall ist. *Aposyla* aus Australien, äusserlich unsern *Boros* sehr ähnlich, hat nicht getrennte Vorderhüften, es fehlt also eine Wand zwischen den Hüften, und dieser Charakter zwingt uns die Gattung überhaupt aus der Familie der Tenebrioniden herauszunehmen und sie den Lagriiden zuzuweisen.

Aber auch, abgesehen von dem Merkmale der offenen Vorderhüften, ist unsere Gattung durch den fast beispiellosen Fühlerbau ausgezeichnet. Das erste Glied ist ausserordentlich verlängert, beim Weibchen schräg abgeschnitten und die folgenden Glieder sind an der schrägen Seite eingelenkt, beim Männchen dagegen ist das gewaltig verlängerte erste Fühlerglied hakenförmig und die folgenden Glieder sind in der Mitte des Gliedes eingelenkt. Auf den ersten Anblick könnte man geneigt sein dieses erste Glied für die stark verlängerten Mandibeln zu halten. Nähere Verwandtschaft mit irgend einer andern Gattung besteht nicht.

Ich verzichte darauf auf diese neue Gattung eine eigene Unterfamilie zu errichten, die nur aus dieser Gattung und dieser Art besteht; sie wäre aber viel berechtigter als viele andere.

Labidocera abnormis sp. nov. Tafel 1, Fig. 4.

Kurz, ziemlich parallel, glänzend braun, aber durch ziemlich dichte Behaarung etwas matt.

Der Kopf ist sehr gross und breit, beim Männchen der ganzen Breite nach leicht vertieft. Die Augen sind sehr klein, ihr Innenrand gebogen, die Wangen sind dick und glänzend, der ganze Kopf ist leicht und deutlich punktiert, das Epistom ist stumpfwinklig vorgezogen. Beim Weibchen ist der Kopf sanft gewölbt. Das erste Fühlerglied des Männchens (siehe die Gattungsbeschreibung) ist sehr lang, hornförmig, gekantet, auf der Innenseite leicht geschwollen, aussen direkt unter der Einlenkungsstelle der folgenden Fühlerglieder leicht winklig abgesetzt, das letzte Ende ist scharfwinklig geknickt und nach innen gerichtet, auch dieses hornartige erste Glied ist fein behaart. Das Ende der Fühler bildet eine starke, aber schlecht abgesetzte Keule; die vorletzten Glieder sind sehr stark quer, etwas becherförmig, Glied 2 der Fühler ist grösser und dicker als 3.

Der Halsschild ist beim Männchen breiter als die Flügeldecken, Hinterecken fehlen ganz, die Seiten sind stark gerundet und gehen direkt in die Basis über, die Querwölbung ist stark, die Seiten fallen steil ab, doch ist die Seitenrandkante von oben sichtbar, sie ist mit einer schmalen, scharfen Randkehle versehen. Die Vorderecken treten, von oben gesehen, ganz leicht vor, sind aber ebenfalls verrundet, die basalen Grübchen sind sehr breit und ganz undeutlich, die Punktierung ist sehr dicht und fein, gleichmässig.

Die Flügeldecken sind in der Basalhälfte ganz parallelseitig, sie sind ebenfalls dicht und gleichmässig, sehr fein verworren punktiert. Die Punkte sind etwas reibeisenartig, das heisst, sie haben einen scharfen Vorderrand. Jeder hat ein schräg nach hinten gerichtetes, etwas anliegendes, goldgelbes Härchen. Die Schulterecken sind breit verrundet rechtwinklig. Die Seitenrandkante ist von oben vollständig überdeckt. Ueber die Unterseite ist in der Gattungsbeschreibung nachzulesen.

Länge, 2.5 bis 3.2 millimeter.

Mentawei, Si-Oban, April bis August, 1894 (*E. Modigliani*). Java, Tjompea, 11ten März, 1904 (*W. Kraepelin*).

Vier Männchen, 2 Weibchen, in den Sammlungen München, Hamburg, und Gebien (Typen)! Doch muss die Art auch im Museum Kopenhagen vertreten sein, von dem ich sie tauschte.

Genus **PENTAPHYLLUS** Latreille [2]

Pentaphyllus LATREILLE, Regne Anim. II, V (1829) 30.

Von dieser Gattung sind aus dem indo-malayischen Gebiet bisher drei Arten beschrieben, alle von Borneo; ausserdem ist eine Art von Japan bekannt, die mir leider nicht vorliegt. Die meisten Arten aus dem tropischen Afrika und Asien sind beim Männchen in mannichfaltiger Weise gehörnt, und unterscheiden sich dadurch von den nordischen Arten.

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[2] Weitere Literaturangaben siehe Gebien: Col. Cat. par 28, p. 387.

Auf eine Beschreibung der Gattung kann verzichtet werden, sie ist ausführlich mehrfach erfolgt. Est ist möglich dass eine oder die andere Art, welche Motschulsky als *Hoplocephala* beschrieb, hierher gehört, aber nicht gerade wahrscheinlich, da er alle seine Arten gestreift punktiert nennt. Sicher ist aber *Hoplocephala* (*Arrhenoplita*) *pygmaea* Champion aus Australien ein echter *Pentaphyllus*.

Uebersicht über die asiatischen Arten der Gattung Pentaphyllus Latreille.

1. Die ganzen Wangen des Männchens sind stark zahnförmig, dreieckig aufgebogen, Stirn neben den Augen langgrubig vertieft, Vorderschienen stark gestachelt. (Philippinen.) .... **P. spinipes sp. nov.**
   Die Wangen sind nie zahnförmig aufgebogen, wohl aber findet sich häufig ein Zähnchen an den Ecken des Epistoms. Stirn neben den Augen nicht breit gefurcht, Schienen fein gestachelt oder glatt .... 2.
2. Pronotum vorn gerandet; Arten nackt, lackglänzend, Männchen mit Hörnchen oder Spitzchen auf dem Epistom .... 3.
   Pronotum vorn ungerandet; Arten fein anliegend behaart, matt glänzend, Männchen höchstens mit zwei konischen Tuberkeln entfernt vom Vorderrand des Epistoms .... 7.
3. Flügeldecken tief gefurcht. (Borneo.) .... **P. striatus Gebien.**
   Flügeldecken ohne Spur von Streifen .... 4.
4. Oberseite einfarbig, oder die Decken nur ganz undeutlich hellgefleckt .. 5.
   Oberseite hellgelb mit schwarzer Deckenbasis oder schwarz mit je zwei hellen Binden auf den Decken .... 6.
5. Flügeldecken mit je einer etwas helleren Binde vorn, die Ecken des Epistoms beim Männchen nur leicht spitzchenförmig, nicht hornartig aufgebogen, Punktierung fein, die Punkte scharf eingestochen. (Mentawei.) .... **P. mentaweicus sp. nov.**
   Flügeldecken ganz einfarbig, die Ecken des Epistoms beim gut entwickelten Männchen mit Hörnchen, Punktierung gröber, aber flach. (Borneo.) .... **P. 4-cornis Gebien.**
6. Körper schmal, gelb, Deckenbasis schwarz. (Ceylon.) .. **P. basalis sp. nov.**
   Körper breit, schwarz, Decken mit je zwei hellen Binden. (Neu-Guinea.) **P. bifasciatus sp. nov.**
7. Körper kurz, Männchen mit zwei konischen Tuberkeln auf dem Clypeus, Prosternum hinten nur leicht gesenkt, dann scharf senkrecht abgeschnitten. (Borneo; Philippinen.) .... **P. biconiger Gebien.**
   Körper zylindrisch, länger, Männchen ohne Tuberkeln. Prosternum bis zum Grunde heruntergedrückt; mit Kiel am Absturz. (Java.) **P. inermis sp. nov.**

Pentaphyllus basalis sp. nov.

Ziemlich schlank, etwas flach zylindrisch, gelb, der Hinterkopf und die Basis der Flügeldecken schwarzbraun, Körper fast nackt, äusserst kurz, sehr sparsam, etwas schuppenförmig behaart.

Der Kopf ist auf der Stirn beim Weibchen mit einer breiten flachen Grube versehen, beim Männchen dagegen sehr tief eingedrückt, die Grube des Weibchens deutlich punktiert, beim Männchen glatt. Die Wangen schnüren die Augen deutlich etwas ein. Beim Männchen erhebt sich jederseits innen neben den Augen ein kurzes, senkrechtes, konisches Horn, das nackt ist, beim Weibchen finden sich dort zwei rundliche Tuberkeln, das Epistom ist im ersteren Geschlecht mit spitzen, etwas aufgebogenen, aber nicht hörnchenartigen Ecken versehen, beim Weibchen ist der Vorderteil des Kopfes ungefähr halbkreisförmig vorgezogen. Die Fühler haben eine gut abgesetzte 5-gliedrige Keule deren Glieder stark quer, oben sehr scharfkantig sind, Glied 3 ist viel länger als breit, 4 und 5 sind etwas kugelig, so breit wie lang, 6 ist leicht quer. Das Kinn ist stark gehöckert, die grob fazettierten Augen treten unten nahe an den Maxillarausschnitt.

Der Halsschild ist querüber fast zylindrisch gewölbt, doch ist die Seitenrandkante von oben der ganzen Länge nach sichtbar. Die Seiten sind sanft gerundet, Vorder- und Hinterrand gerade abgestutzt, die Ecken sind breit verrundet. Die Punktierung ist zwar fein, aber sehr deutlich, nicht gedrängt, einfach. Die Breite ist nicht ganz doppelt so gross wie die Länge.

Die Flügeldecken sind an der Basis schwarzbraun, der Fleck ist etwas dreieckig, das heisst, am Schildchen viel breiter als an den Seiten. Die Punktierung ist äusserst fein, gânz verworren, aber die Decken sind durchscheinend und man erkennt daher Reihen von Punktflecken, die bei flüchtiger Betrachtung Punktreihen vortäuschen können. Die Seitenrandkante ist von oben nicht zu erkennen. Das Prosternum ist hinter den Hüften wagerecht.

Länge, 2.1 bis 2.2 Millimeter.

Zwei Männchen von Ceylon (*Nietner*) im Museum Berlin, das mir ein Exemplar für meine Sammlung überliess. Ein Weibchen von Ceylon, Nalanda (*W. Horn,* 1899) im Museum Dahlem.

Diese gelbe Art ist an der Färbung leicht zu erkennen. Die Kopfbildung des Männchens ist ähnlich wie bei *striatus* und *4-cornis,* doch ist bei diesen beiden Arten die Stirn nicht so tief eingedrückt, und die Ecken des Epistoms sind hornartig. Die Färbung ist ganz anders, der Körper viel schmäler. *Pentaphyllus striatus* hat überdies gefurchte Decken.

Pentaphyllus bifasciatus sp. nov.

Kurz elliptisch, etwas depress, der wagerechte Querdurchmesser also wesentlich grösser als der senkrechte, glänzend schwarz, Flügeldecken mit zwei roten Querbinden, Fühler und Beine rotbraun, Unterseite schwarz, Körper nackt.

Der Kopf des Männchens ist der Länge nach kräftig ausgehöhlt, vorn quer eingedrückt, am Innenrand der Augen finden sich zwei senkrecht aufgesetzte, kräftige, spitze, nackte, gleiche Hörner, die Stirn ist weit über doppelt so breit wie ein Auge von oben gesehen, das Epistom ist in breitem Bogen verrundet und hat jederseits ein winziges aufgesetztes Zähnchen. Die Punktierung ist äusserst fein, in der Punktierung kaum sichtbar. Beim Weibchen fehlt die Stirngrube, nur der Quereindruck ist vorhanden, ebensowenig sind Hörnchen und Spitzchen des Epistoms ausgebildet. Die Punktierung ist ziemlich weitläufig. äusserst fein. Die Fühler sind dick und haben eine stark abgesetzte, 5-gliedrige Keule, Glied 3 ist etwas länger als 4, 4 und 5 sind klein, so breit wie lang, 6 schwach quer, die letzten fünf sind stark in die Quere gezogen und ziemlich dicht aufeinander geschlossen, oben sehr scharfkantig.

Der Halsschild ist stark quer, fällt an den Seiten senkrecht ab. Die Spitzenrandung ist vollständig. Der ganz schwach vorgezogene basale Mittellappen hat auch in der Mitte keine Spur von Randlinie oder Aufbiegung. Alle Ecken sind breit verrundet, die Mitte des Vorderrandes ist in starkem Bogen vorgezogen. Die Punktierung ist sehr scharf aber fein und wenig dicht, das Schildchen ist rechtwinklig dreieckig.

Die Flügeldecken sind ganz irregulär, etwas gröber als der Halsschild punktiert. Jede Decke hat zwei quere, nicht gezackte, ziemlich schmale Binden, die vom Seitenrand wagerecht über die Decken gehen, aber vor der Naht aufhalten. Die Binden sind ungefähr so breit wie der schwarze Raum vor der vorderen. Die Seitenrandkante ist von oben nicht sichtbar. Die Unterseite ist blank, schwarz, das Prosternum ist hinten gerundet gesenkt, die Propleuren sind der ganzen Länge nach ausgehöhlt.

Länge, 2.1 bis 2.2 Millimeter.

Zwei Pärchen von Neu-Guinea, Dorey, im Britischen Museum und im Museum München; 1 Exemplar, in meiner Sammlung.

Die schwarze Farbe und die beiden hellen Querbinden auf den Decken unterscheiden diese Art von allen Gattungsgenossen.

Pentaphyllus mentaweicus sp. nov.

Sehr kurz elliptisch, nicht parallelseitig, schwach flach gedrückt, nicht eigentlich zylindrisch, Oberseite lackglänzend braun, Flügeldecken vorn mit einer ganz verwaschenen, oft undeutlichen hellen Querbinde, Fühler und Beine gelbbraun.

Der Kopf des Männchens hat zwischen den Augen zwei senkrechte, spitze, aber nicht sehr lange Hörner, ferner sind die Ecken des Epistoms leicht zähnchenartig aufgebogen, nicht eigentlich gehörnt. Die Stirn ist beim Männchen kräftig grubenförmig, eingedrückt, spiegelblank, mit kaum einer Spur von Pünktchen, der Vorderkopf ist halbkreisförmig, die Stirn ist vorn doppelt so breit wei ein Auge von oben gesehen. Beim Weibchen fehlt jede Spur von Eindruck auf der Stirn, doch ist die Querfurche gut ausgeprägt. Die Fühler haben eine dünne Wurzel, Glied 3 ist etwas länger als breit, konisch, 4 und 5 sind so breit wie lang, sehr klein, 6 ist etwas quer, die letzten fünf bilden eine stark abgesetzte Keule von sehr stark queren Gliedern, deren obere Kante sehr scharf ist, das letzte Glied hat eine abgesetzte dünnere Spitze. Das Kinn ist stark gewölbt, fast gehöckert. Zwischen Auge und Maxillarausschnitt bleibt ein Zwischenraum, breiter als das dritte Fühlerglied lang.

Der Halsschild ist stark gewölbt, aber die Seitenrandkante ist von oben breit sichtbar, die Seiten sind stark gerundet, die Ecken ganz abgerundet, die Basis ist ungerandet und nirgend aufgebogen, die Spitzenrandung ist vollständig, aber äusserst fein, der Vorderrand ist leicht bogig vorgezogen. Die Punktierung ist sehr scharf, aber ausserordentlich fein und wenig dicht.

Die Flügeldecken sind stark gewölbt, die Seitenrandkante ist nur dicht hinter der Schulter gut von oben sichtbar, weiter hinten überdeckt. Die Oberfläche ist verworren punktiert, die Punkte sind so weitläufig und fein wie die des Halsschildes. Vorn findet sich eine gelbliche, ziemlich undeutliche Querbinde, die aussen breiter ist als innen und die Naht nicht erreicht. Da die Flügeldecken etwas durchscheinend sind, erkennt man Reihenflecken von der Unterseite her.

Die Unterseite ist fast nackt, das Prosternum wie gewöhnlich in sehr breitem Bogen stark ausgeschnitten, zwischen den Hüften schmal, hinten stark gesenkt und hat dann einen scharfen, senkrechten Absturz. Die Mittelbrust ist schmal und liegt tief. Die Hinterbrust ist vorn stark gerandet, der Rand aufgebogen, die Brust wird durch eine kurze Längsfurche von hinten her geteilt, der Abdominalfortsatz hat ebenfalls einen stark aufgebogenen Rand. Beine ohne Auszeichnung.

Länge, 2.5 bis 2.9 Millimeter.

Zwölf Exemplare in den Sammlungen Dahlem, München, und Gebien (Typen !).

Mentawei, Si-Oban, April bis August, 1894, und Sipora, Mai bis Juni, 1894 (*Modigliani*).

Diese Art schliesst sich in der Körperform und dem starken Glanz an die vorige, unterscheidet sich aber sofort durch Färbung und Zeichnung; die vordere Binde ist, da der Körper sehr hell ist, undeutlich.

Pentaphyllus 4-cornis Gebien.

Pentaphyllus 4-cornis GEBIEN, Saraw. Mus. Journ. 2 (1914) 23.

Pentaphyllus 4-cornis ist der vorigen Art sehr ähnlich, doch sind bei gut entwickelten Männchen die Zähnchen des Epistoms hornartig, die Punktierung der Oberseite ist gröber, aber die Punkte sind flach, eine Querbinde auf den Decken fehlt, ausserdem ist der Körper länglicher.

Borneo, Banguey. Mentawei, Si-Oban.

In den Sammlungen Gebien (Typen !) und Dahlem.

Pentaphyllus striatus Gebien.

Pentaphyllus striatus GEBIEN, Saraw. Mus. Journ. 2 (1914) 22.

Die Bewaffnung des Kopfes beim Männchen weist dieser Art einen Platz an neben den vorhergehenden, sie ist ebenfalls braun glänzend, nackt, aber sie ist von allen mir bekannten Arten durch die gefurchten Decken verschieden. Die Punkte in den Furchen sind nicht regelmässig gestellt, sondern unordentlich.

Borneo, Banguey.

In meiner Sammlung.

Pentaphyllus biconiger Gebien.

Pentaphyllus biconiger GEBIEN, Saraw. Mus. Journ. 2 (1914) 23.

Diese kleine Art ist viel näher mit den beiden europäischen Arten als mit den Asiaten verwandt, sie ist wie diese fein behaart, matt glänzend, der Halsschild ist vorn nicht gerandet, sie unterscheidet sich durch die Kopfbildung des Männchens, dieses hat auf dem Clypeus (nicht am Vorderrand des Epistoms) zwei konische, kräftige Tuberkeln.

Borneo, Banguey, in meiner Sammlung. Philippinen, Palawan, Puerto Princesa. Luzon, Los Baños (*Baker 7008, 5998, 8493*).

Dieser Art nahe verwandt ist eine neue aus Ceylon (*Nietner*), von welcher mir leider nur ein einziges Exemplar vorliegt, das ich nicht zu beschreiben wage, doch sind hier zwei kräftige Hörner vorhanden und der Körper ist lang zylindrisch, bei *biconiger* dagegen sehr kurz, auch sind die Augen grösser, ferner ist die Punktierung dichter und daher ist der Körper matt.

Pentaphyllus inermis sp. nov.

Hellbraun, zylindrisch (im Querdurchmesser kreisförmig), mattglänzend, Körper nicht sehr dicht mit anliegenden, goldgelben Härchen bekleidet.

Kopf in beiden Geschlechtern einfach, ungehörnt, Stirn flach, ohne Tuberkeln, zwischen den Augen nicht ganz doppelt so breit wie ein Auge. Die Augen sind gross, grob fazettiert, durch die Wangen nicht eingeengt. Die Querfurche ist ein kräftiger Eindruck, der hinten flach ist; die Wangen sind sehr kurz, die Seiten des Vorderkopfes stark eingezogen verengt, daher ist das Epistom auf kurze Strecke parallelseitig, der Vorderrand ist ganz gerade abgeschnitten, die Punktierung ist äusserst fein, nicht sehr eng, gleichmässig. Die Fühler haben wie gewöhnlich eine 5-gliedrige Keule, die stark abgesetzt ist und aus sehr queren Gliedern besteht, das letzte ist viel kleiner als das zehnte, so breit wie lang oder schwach quer, die mittleren Glieder sind winzig klein, perlig, Glied 2 ist viel dicker als 3, dieses ist etwas länger als breit, schwach konisch. Das Endglied der Maxillarpalpen ist lang zylindrisch, die Augen treten unten bis fast unter den Maxillarausschnitt.

Der Halsschild ist vorn ungerandet, viel stärker als der Kopf punktiert, die Punkte sind dicht, im Grunde flach. Die Seiten sind von oben gesehen stark gerundet, von der Seite gesehen fast halbkreisförmig da die Ecken in sehr breitem Bogen verrundet sind.

Die ganz verworrene Punktierung der Flügeldecken ist gröber als die des Halsschildes, nicht gedrängt, etwas rauh, jedes Pünktchen hat ein anliegendes Härchen.

Die Unterseite ist nackt; das Prosternum ist vor den Hüften ausserordentlich kurz, fast kürzer als zwischen den Hüften breit, aber auch dort sehr schmal, es ist in der Längsrichtung stark gewölbt, fällt vorn stark, hinten bis zum Grunde ganz ab und ist im hinteren Absturz gekielt. Die Mittelbrust ist nicht einfach rinnig vertieft, sondern hinten senkrecht eingedrückt, so dass sie ganz tief liegt. Die Hinterbrust ist viel länger als bei den vorhergehenden Arten, viel länger als der Durchmesser einer

Hüfte, ihre Mittellinie ist kräftig gefurcht. Das Abdomen ist ziemlich stark punktiert, die Schenkel sind dünn, die Schienen zur Spitze deutlich etwas dreieckig verbreitert, an den Hintertarsen ist Glied 1 kürzer als 2 und 3 zusammen.

Länge, 2,3 bis 2.6 Millimeter.

Java, Preanger, 4,000 bis 6,000 Fuss (*Dr. O. Warburg*). Ostjava (*Warburg*). Java, Samarang.

Vierzehn Exemplare in den Sammlungen Hamburg, Veth, und Gebien.

Pentaphyllus biconiger, die nächstverwandte Art aus dem asiatischen Gebiet, stimmt mit unserer in dem vorn nicht gerandeten Pronotum, dem leicht behaarten Körper, dem matten Glanz überein; sie unterscheidet sich aber durch kürzeren, breiteren Körper, durch die Prosternalbildung; die Vorderbrust ist zuerst etwas niedergebogen und fällt dann senkrecht, scharf ab, bei unserer Art dagegen ist das Prosternum einfach, ganz heruntergebogen und am Absturz gekielt. Ferner hat *biconiger* beim Männchen auf dem Clypeus zwei kleine, konische Tuberkeln, die bei unserer Art fehlen.

Pentaphyllus oblongus Lewis.

Pentaphyllus oblongus LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 398.

Die Art is mir unbekannt geblieben. Die Beschreibung ist leider ungenügend und lässt mancherlei Zweifel; wir erfahren nicht ob die Art nackt oder behaart ist, ob das Männchen einen bewaffneten Kopf hat oder nicht, ob das Pronotum vorn gerandet ist, ausserdem schweigt der Verfasser über die Bildung des Prosternums und die Länge der Hinterbrust. Aber abweichend von allen mir bekannten Arten ist der Fühlerbau, ferner sind die Decken leicht gestreift und der Kopf ist leicht längsgestrichelt.

Japan.

Pentaphyllus spinipes sp. nov. Tafel 1, Fig. 5.

Zylindrisch, hellbraun, lackglänzend.

Männchen, Kopf zwischen den Augen flach, innen, neben ihnen, grubig vertieft, die breite Grube läuft am Auge nach hinten und lässt ihren Innenrand erhaben erscheinen, Stirnhörner fehlen. Die Augen sind länglich, durchaus nicht eingeschnürt, die Stirn ist vorn sehr breit, sie ist sehr fein und nicht eng punktiert. Die ganzen Wangen sind bis vorn zum Epistom sehr stark dreieckig, hornartig aufgebogen, diese Hörner seitlich scharf kompress. Die kurzen Fühler haben eine stark abgesetzte Keule von fünf sehr queren Gliedern, auch das letzte ist breiter als lang, Glied 2 ist kaum dicker als 3.

Der Halsschild ist gröber und weitläufiger punktiert als der Kopf, die Punkte sind rund, flach, alle Ecken sind breit verrundet, die Basis ist jederseits flach ausgebuchtet, die Spitze ist nicht deutlich gerandet.

Die Flügeldecken sind verworren punktiert, die Punkte so grob wie die des Halsschildes, Streifen fehlen.

Die Unterseite ist vorn deutlich anliegend behaart; das Prosternum ist zwischen den Hüften schmal, vor ihnen ziemlich lang, es fällt hinten bis zum Grunde senkrecht ab, von der Seite gesehen ist es halbkreisförmig gewölbt. Der Eindruck des Mesosternums ist vorn senkrecht, das Abdomen kräftig und etwas feilenartig punktiert. Die Beine sind kurz, die Schienen verhältnismässig breit, aussen mit scharfer, stacheliger Kante, die besonders an den Vorderschienen sehr deutlich ist; die Stacheln sind dort gleichartig, nicht spitz, borstenförmig, das heisst, parallelseitig, aber klein. Die Hinterseite der Vorderschienen ist gegen das Ende leicht ausgehöhlt, die Aussenrandkante ist also dort, von der Seite gesehen, leicht nach hinten geschwungen.

Länge, 3.2 Millimeter.

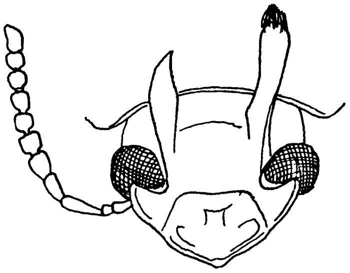
Ein Männchen von den Philippinen, Mindanao (*H. Peters*), in meiner Sammlung, mir von dem Entdecker freundlichst überlassen.

Diese robuste, lackglänzende Art ist durch die Kopfbildung des Männchens von allen andern mir bekannten Arten geschieden. Es ist bei den Arten der Gattung im männlichen Geschlecht entweder der Kopf ganz einfach, nicht ausgezeichnet, oder nur auf der Stirn, oder auf dem Epistom mit Hörnern oder Tuberkeln, bei den asiatischen Arten meist auf der Stirn mit Hörnchen und auf dem Epistom mit Zähnchen. Aber nie sind die ganzen Wangen stark zahnförmig aufgebogen wie bei vorliegender Art. Ueberdies sind die stark stacheligen Schienen auffällig. Im Gegensatz zu den andern nackten, blanken Arten ist unsere vorn am Pronotum nicht deutlich gerandet.

ILLUSTRATION

TAFEL 1

FIG. 1. *Anisocara gynandromorpha* sp. nov. Kopf des Männchens.
2. *Menimus rugicollis* sp. nov.
3. *Menimus ovalis* Allard. Fühler.
4. *Labidocera abnormis* sp. nov. *a,* Kopf des Männchens; *b,* Fühler des Weibchens.
5. *Pentaphyllus spinipes* sp. nov. *a,* Kopf des Männchens; *b,* Vorderbein.



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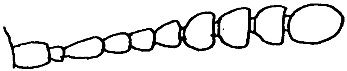

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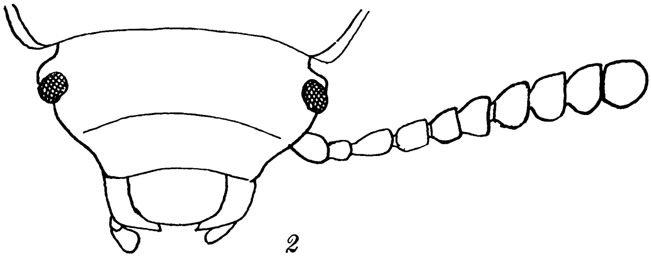

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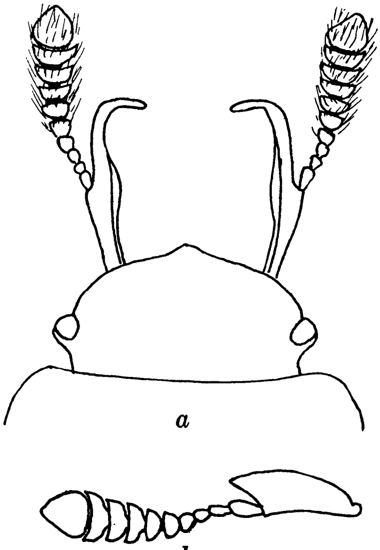

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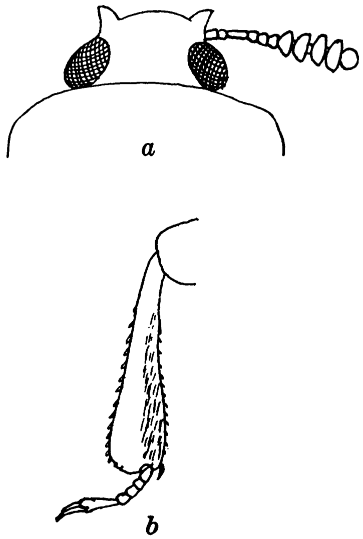

5

TAFEL 1.

UNIV. OF MICH.

CRICKET-LOCUSTS (GRYLLACRIDÆ), CHIEFLY FROM THE PHILIPPINE ISLANDS

By H. H. KARNY

Of Buitenzorg, Dutch East Indies

TEN PLATES

In this paper are discussed some gryllacrids collected by Prof. C. F. Baker, chiefly in the Philippine Islands. The study thereof proved to be very interesting as most of the Philippine species were known hitherto from only one or a very few specimens. Moreover, our knowledge of the fauna of Luzon, as well as of that of the other Philippine islands, was extremely poor. It was therefore to be expected that comparatively many of these gryllacrids before me should belong to new species or subspecies, as a great part of the material was collected on other islands. I wish to express here my sincerest thanks to Professor Baker, to whose kindness I owe the receipt of this very important material. The types of the new species and subspecies described here are preserved in the Buitenzorg Zoölogical Museum.

This material has shown also some interesting connections between my venational system and the geographical distribution of gryllacrids. When revising the gryllacrids of Buitenzorg Museum[1] I found there only a single specimen of venational type III, originating from Batjan, Moluccas, but none from the Sunda Islands. Now, in the Philippine material before me, about half of all the specimens belong to this type. This fact is worthy of notice, especially as the Moluccas show some zoögeographical relations with the Philippines in other respects also. On the other hand, I know no species of venational type III from the Malaysian region (s. str.).

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[1] Treubia 5, Livr. 1-3 (1924) 47-103, 206-234.

VENATIONAL TYPE I [2]

Gryllacris arctatiformis sp. nov.

Gryllacris arctata KARNY (nec Walker), Treubia 5, Livr. 1–3 (1924) 59 (without the literature there cited).

When writing my paper [3] I had only two specimens of this species before me, but none of the true *arctata.* As stated there, I found a slight difference in venation on comparing my specimens with Griffini's figure, but I thought it not sufficient to warrant the establishment of a separate species. In the meantime, I received from Professor Baker three specimens of true *arctata.* It is now clear that there are also differences in the other characters, and the southern species is therefore to be regarded as a new one.

Very similar to *Gryllacris arctata.* General color tawny yellow. Head narrower than in that species, and more obconical in frontal aspect. No ocellar spots visible. Frontal fastigium without dark markings. Fastigium of vertex as wide as first antennal joint, narrower than in *arctata.*

Pronotum (Plate 4, fig. 3) practically as in *arctata* (Plate 4, fig. 4), but the humeral sinus less distinct. All legs longer and slenderer than in *arctata;* especially the fore and middle tibiæ distinctly longer, set with much longer, movable spines (Plate 4, fig. 5). Hind femora incrassate in basal half, about four times as long as wide (Plate 4, fig. 5) ; in *arctata* scarcely three times as long (Plate 4, fig. 2). Tegmina (Plate 2, fig. 4) a little narrower than in *arctata.* Radial sector arising in the apical third of tegmen. No oblique cross veins between medial and cubital veins (Type I, s. str.) ; the former simple, the latter three-branched.

Ovipositor slightly curved, practically of the same shape as in *arctata,* but shorter. Female subgenital plate semicircularly rounded (Plate 3, fig. 4) ; male unknown.

Measurements of Gryllacris arctatiformis sp. nov.

Length.	Female. mm.
Body	16.4–20
Pronotum	3 – 3.4
Tegmina	21.3–21.5
Fore tibiæ	7 – 7.3
Hind femora	11.2–12
Ovipositor	6.5– 7.4

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[2] Treubia 5, Livr. 1–3 (1924) 50, 54.

[3] Treubia 5, Livr. 1–3 (1924) 50, 54.

Two females from Mindanao; one from Davao (type), one from Butuan (*Baker*).

Gryllacris arctata Walker.[4]

A little stouter than the preceding species. Ocellar spots distinct, pale yellowish. The two upper ones small, placed at the sides of fastigium of vertices, close to the antennal grooves; the lower one very large, ovate, occupying almost the whole surface of frontal fastigium. This shows in one of the three specimens before me at the sides and above a distinct black margin, as described by Walker; the two others without black markings. Lower margin of front (close to the clypeus) slightly blackish. Fastigium of vertex a little wider than the first antennal joint.

Legs shorter and stouter than in the preceding species; fore and middle tibiæ set with much shorter spines (Plate 4, fig. 6). Venation of tegmina (Plate 2, fig. 3) according to venational type Ia, namely, with an oblique cross vein between medial and cubital veins. Radius with four branches against the fore margin in the distal part. Radial sector arising from radius always in the middle of tegmen, four-branched; sometimes radial vein five-branched and then the sector three-branched only. Medial vein simple; cubital vein always two-branched (simply forked).

Ovipositor slightly curved, longer than in the preceding species. Female subgenital plate (Plate 3, fig. 2) pentagonal, with rather acute lateral angles, distad emarginated at extreme tip. In addition to Griffini's description of male genitalia[5] I give here a figure of male end of abdomen, as seen from behind (Plate 3, fig. 3).

Measurements of Gryllacris arctata Walker.

Length.	Male.	Female.
	mm.	*mm.*
Body	16.5–17	18.5
Pronotum	3.8– 4	3.7
Tegmina	22 –23.5	25.5
Fore tibiæ	5 – 6	5.3
Hind femora	9.2– 9.5	9.4
Ovipositor	------------	9.8

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[4] To this species belongs the literature cited in Treubia **5**, Livr. 1–3 (1924) 59; see also Hebard, Proc. Acad. Nat. Sci. Philadelphia **74** (1922) 276.

[5] Atti Soc. It. Sci. Nat. **48** (1909) 99.

Three specimens before me; from Mount Maquiling, Luzon, 2 males, and from Los Baños, 1 female (*Baker*).

VENATIONAL TYPE II [6]

Gryllacris pictipes sp. nov.

Allied to *fumigata* De Haan, *nigripennis* Gerstäcker, and *trimaculata* Griffini.

Head pale, tawny yellow, with a slight rosy tinge, especially on occiput and the hind part of genæ. Eyes dark brown. Behind them the lateral margins of occiput are dark blackish infumated. Ocellar spots very small, pale yellow, rather indistinct. Fastigium of vertex not quite twice as wide as first antennal joint. No sulcus between vertex and frontal fastigium. Scrobes of antennæ with black margins. First antennal joint pale, blackish at tip; the following joints shining black until about the middle of pronotum, then gradually becoming brownish. Below eyes at sides of front a sharp, black subocular band. Mandibles and labrum shining black, except extreme tip of latter which is brownish. Palpi yellowish gray; the three distal joints of maxillary palpi linear, scarcely widened distad, smoky gray in distal half. Apical joint of labial palpi strongly widened distad, infundibuliform, obliquely truncate and excavate at the end, smoky gray along median margin of excavation, on both excavated and convex sides.

Pronotum as long as wide, with sharply protruding, linear margins. Fore and hind margins very slightly rounded, the latter almost truncate. Lateral lobes not very high, moderately appressed, with rounded fore and hind angles and a very shallow humeral sinus. Lower margin descending backward. Behind the hind angles a thick, blunt, pale yellowish tooth, directed backward. Anterior transverse sulcus of disk broad and shallow, posterior scarcely any. Longitudinal sulcus distinct, shallow, with a more distinct impression on both ends, reaching from about the beginning of third to the end of fourth fifth of pronotal length. The U-shaped furrow of lateral lobes well impressed, especially with a stronger impression at anterior end. Posterior (descendent) sulcus of lateral lobes distinct. The surface above these furrows strongly arched.

General color of pronotum (Plate 2, figs. 1 and 2) pale yellowish, with a brownish pink tinge on disk. Margins all around shining black, except in the neighborhood of fore angles of lateral lobes, where they are of the same pale color as the surface. The black color of fore margin produced backward into two blackish spots on fore part of disk separated from one another by a narrow median pink stripe; behind these two spots are two smaller ones on the disk at the place where in *signifera* the widened part of the 7-shaped spot is situated. Median furrow blackish. The arched part above the U-sulcus of lateral lobes also black, and the arched part behind blackish margined but pale in the center. Before the upper fore angle of the large black spot at U-sulcus a minute doubled grayish spot; between the large spot and the dark median sulcus a blackish longitudinal line, confluent with the large spot in the hind part.

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[6] Treubia 5, Livr. 1–3 (1924) 51, 61.

Mesopleura and metapleura each with an oblique, dark gray stripe, from base of tegmina and hind wings, respectively, to coxa. All femora yellowish, along undersurface black throughout the whole length; in the distal third or thereabouts shining black as also above and on both sides; before this black area with a slight rosy tinge above. All tibiæ bright yellow with relatively long, black spines, and abruptly shining black at base and apex. All tarsi shining black above, tawny below; last joint and claws black also beneath.

Forewings hyaline in basal half and along fore and hind margin, smoky gray in distal half, but here also some cells hyaline in center. Venation (Plate 3, fig. 1) according to venational type II. Anterior basal cell distad, far overreaching posterior one. Radial vein five- or six-branched; Rs + M four-branched. Median vein arising from base of tegmen as a separate stem, then united with radial vein for a distance of about four cross veins, then separate again to its communication with radial sector. Cubital vein three-branched; the oblique cross vein between medial and cubital veins reaching the latter close behind origin of hind branch; fore branch distad thereof forked again.

Hind wings intermediate between the triangular and cycloid types, dark smoky gray from base to margins. The cells, about three rows along outer margin, dark throughout; the others with obsoletely hyaline centers. Cross veins margined on both sides with a very fine hyaline line; the same is the case with the branches of radial sector and with the spurious length veins near the outer margin. Cross veins before Rs, especially in basal part of wing, without hyaline margins.

Abdomen grayish brown, blackish at apex. Cerci yellow. End of male abdomen (Plate 4, fig. 13) very similar to that of *nigripennis* and its allies, according to type B. Cerci, styles, and margin of subgenital plate set with long bristly hairs.

Measurements of Gryllacris pictipes sp. nov.

Length.	Male. mm.
Body	30
Pronotum	7
Tegmina	37
Hind femora	16.5

One male from Mount Maquiling, Luzon (*Baker*).

This species is well characterized by its long anterior basal cell. In all the specimens of *Gryllacris fumigata* and its subspecies, the venation of which I had the opportunity to study, the anterior basal cell does not overreach the posterior one distad. I have seen no specimen of Griffini's *trimaculata,* and the author says nothing in his description as to venation. If *trimaculata* also possesses a long anterior basal cell, it must be considered, I believe, as a separate species; if these cells are of the same shape as in *fumigata,* it may remain as a subspecies thereof. *Gryllacris pictipes* differs, however, from *trimaculata* by its sharp, dark subocular bands, by the black pictured legs, and by the hyaline margins of cross veins on hind wings. From *fumigata* it may be distinguished, besides the venational characters, especially by the black markings of pronotum.

VENATIONAL TYPE III [7]

Gryllacris plebeia Stål.

> *Gryllacris plebeia* STÅL, Oefv. Vet.-Akad. Förh. (10) **34** (1877) 47; BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien **38** (1888) 334; KIRBY, Syn. Cat. Orth. 2 (1906) 141; GRIFFINI, Atti Soc. It. Sci. Nat. **48** (1909) 91; Boll. Mus. Zool. Anat. Torino No. 668 **28** (1913) 7; Ann. Mus. Nat. Hungar. **11** (1913) 304; Philip. Journ. Sci. § D **10** (1915) 65, 70; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 **15** (1915) 267.

Griffini (1915) gives as the principal characters of the typical form, in describing his var. *immaculata,* the following:

> Pronotum maculis duabus parvis anterioribus fuscis ornatum. Spinae tibiarum posticarum basi subtus nigro-fusco cincta. Elytra campo antico-dimidio basali subhyalino, ibique vena unica obliqua distincta.

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[7] Treubia **5**, Livr. 1–3 (1924) 51, 69.

As to the latter character he says (1909), when describing Stål's type specimen:

> Campo antico in dimidio basali fere haud venato, vitreo, tantum vena obliqua testacea distincta praedito.

I place with this typical form (with some doubt, however) two specimens (1 male, 1 female) of Professor Baker's collection, from northwestern Panay. Each agrees in one character with the typical *plebeia,* the male having the hind tibial spines black throughout and furnished with a black spot on tibia at the spine bases, and the female having blackish spots on the pronotum. The other characters agree in both specimens with Griffini's description of his *immaculata.* Especially as to venation of precostal area, I can find no difference between these two specimens and the specimens of *immaculata* before me. The costal vein is well developed in all the specimens I have seen, testaceous, simple, reaching almost as far as the end of the fore branch of subcosta. Precostal veins two or three, very weak and feeble, nearly hyaline, without cross veins between. If they become still more rudimentary, as they may be in Stål's type, they will be very indistinct; but I do not believe that this will prove to be a character of importance.

The male from northwestern Panay before me has its pronotum quite concolorous, without black markings. It agrees in this character, therefore, with *immaculata.* The venation of tegmina agrees entirely in its chief characters with that of the female from the same locality and with that of *immaculata,* but shows some differences in less valuable characters; it may be, therefore, described and figured here (Plate 9, figs. 1 and 2) as a contribution to our knowledge of the variation of venation in *Gryllacris,* all veins being tawny yellow. Left tegmen: two precostal veins; costa simply forked near base; subcostal vein simple throughout, united near tip with hind branch of costa. Radial sector arising distad from the middle, three-branched; radial vein simple. Then follows a simple longitudinal vein, in the basal part very approximated to the following one and connected with it by some thick cross veins. The following longitudinal vein simply forked at the end of basal third. There can be no doubt that these two longitudinal veins, the simple and the forked, represent together the media which is usually three-branched in this species, but the fore branch here is split off as a separate vein. The following veins simple. Right tegmen: three precostal veins; costa simple; subcosta forked close before tip. Radial sector arising basad from middle, simply forked; radial vein also simply forked. The following vein (media) two-branched; following ones simple.

Hind tibiæ somewhat infuscated at base above; at each spine base with a black spot; spines themselves also entirely shining black. End of abdomen (Plate 3, fig. 5) very similar to that of *immaculata,* described by Griffini in 1913;[8] but tips of lobes of subgenital plate broadly rounded, more approximated to middle line than to styles; the latter slender, certainly movable, distinctly longer than in *immaculata.* Of the typical *plebeia* the male was not known hitherto. It is therefore not impossible that the blackish spots on pronotum are a female character only, and they may perhaps be wanting in the male. I place this male therefore with the typical *plebeia,* especially because of its black spots on hind tibiæ at the spine bases. It is certainly different from *immaculata,* because of the shape of the subgenital plate and styles.

The female from northwestern Panay agrees very well as to the coloration of pronotum with Griffini's description of Stål's type specimen, which is as follows:

> Color pronoti pallide flavido testaceus, leviter incerte nebulosus. Margines omnes anguste dilute ferruginei; maculae duo parvae nigro-fuscae superne adsunt (una utrinque) sat proximae, parum post sulcum anticum, forma incerta, fere triangulares aequilaterae, marginibus et verticibus dilutioribus, vertice externo postico cum macula dilutiore magis incerta connexo.

The female before me has two black spots on each side of disk, namely, one on each end of the V-shaped furrow of lateral lobes, the posterior one larger but less well defined. The upper margin of V-sulcus nebulosely infuscated; longitudinal furrow of disk also slightly darker.

Venation of both tegmina practically the same, corresponding well with that of *immaculata* (Plate 10, figs. 1 to 3). All longitudinal veins behind radius blackish; two or three precostal veins; costa simple; subcosta simple or simply forked close before end. Radial vein simply forked before apex, the fork somewhat longer than the subcostal one; radial sector arising from radius a little distad from the middle, three-branched. Medial vein two-branched or three-branched, in the latter case the hind branch of chief fork forked again. The following veins simple.

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[8] Boll. Mus. Zool. Anat. Torino No. 668 28 (1913) 7, 8.

Spines of hind tibiæ black at apex, yellowish in basal part, without apposed black spots near their bases. Ovipositor slightly curved, a little shorter than hind femora.

I give here the measurements of the two specimens before me, for comparison with the measurements given by Griffini:

Measurements of Gryllacris plebeia Stål.

Length.	Male.	Female.	Length.	Male.	Female.
	mm.	*mm.*		*mm.*	*mm.*
Body	20	27	Fore femora	8	8
Pronotum	5	5.7	Hind femora	14.8	15
Tegmina	16.5	19.5	Ovipositor	------	13.5

Gryllacris plebeia subsp. immaculata Griffini.

Gryllacris plebeia subsp. *immaculata* GRIFFINI, Boll. Mus. Zool. Anat. Torino No. 668 **28** (1913) 7, 8; Philip. Journ. Sci. § D **10** (1915) 65, 70; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 **15** (1915) 267; GRIFFINI, Mon. Zool. It. No. 2 **29** (1918) 28.

Griffini has described this form as a variety only, because he knew no males of the typical *plebeia* and no females of *immaculata*. From the material before me, I cannot doubt that *immaculata* must have subspecific rank at least, if not specific, because of the difference in the shape of the male subgenital plate and styles.

I place with *immaculata* three specimens of the gryllacrids before me; from Los Baños, male (*Baker*), Mount Maquiling, Luzon, female (*Baker*), and Polillo, female (*Taylor*), which agree entirely with Griffini's description. The female from Polillo is stouter than the other specimens; that from Mount Maquiling is small and slender.

Measurements of Gryllacris subsp. immaculata Griffini.

Length.	Male from Los Baños.	Female from Mount Maquiling.	Female from Polillo.
	mm.	*mm.*	*mm.*
Body	20.8	18.3	±25
Pronotum	5.2	4.7	6.1
Tegmina	18.6	15.8	17.8
Fore femora	7.4	6.4	9.2
Hind femora	13.7	12.3	15.5
Ovipositor	---------	11	13.3

I have nothing to add to Griffini's detailed description, except as to the venation of the tegmina, which I describe here for the three specimens before me.

Male from Los Baños.—(Plate 10, fig. 1). Of the four precostal veins on right tegmen, the second and third have a short common stem. Costal vein simple, on left tegmen united before tip with fore branch of subcosta, which is simply forked before the end. Radial vein four-branched, a little before origin of first branch (close distad to the middle of tegmen) giving out the radial sector which remains simple on both tegmina (!). Then follows the three-branched medial vein (fore branch simple, hind branch forked again a short space beyond its origin). Following veins simple.

The male genitalia (Plate 3, fig. 6) quite as described by Griffini, differing from those of typical *plebeia* (specimen from northwestern Panay) by the bluntly angulated tips of subgenital lobes which are more widely distant from one another than from the styles, and by the latter being short and broad, almost triangular.

Female from Mount Maquiling.—(Plate 10, fig. 2). With three very weak and feeble precostal veins; both costa and subcosta simple. Radial vein three-branched; basad from first branch, about in the middle of tegmen, arises the radial sector, which is simply forked before the end. Medial vein simply forked before the middle. Following veins simple.

Female from Polillo.—(Plate 10, fig. 3). With three precostal veins; costa simple. Subcostal vein simply forked a little distad from its middle. Radial vein three-branched; radial sector arising in distal third, distad to the fore radial branch, simply forked. Medial vein three-branched, in the same manner as in the male from Los Baños. Following veins simple.

Female genitalia practically as in the typical form, described by Griffini (1909), but the short median lobe perhaps still shorter in *immaculata.* Griffini says of it "leviter rotundato-prominulo, sed in typo subtus retrorsum plicato." These words may perhaps suggest that the retroflection of its tip might possibly be accidental; but I believe it is a constant specific character, as in *brachyptera* and *fuscinervis* (in these two still more distinct), since I find it the same as described by Griffini also in the *plebeia* (female) from Polillo and in the two *immaculata* (females) before me.

Gryllacris plebeia connexa subsp. nov.

One male from Mount Banahao (*Baker*) agrees very well with *immaculata,* differing very slightly by the blackish castaneous labrum and by a somewhat slenderer body; but the venation of both tegmina shows a remarkable difference from the *immaculata* specimens before me and will therefore be described and figured here (Plate 9, figs. 3 and 4).

With three precostal veins, the third forked on right tegmen. Costal vein simple, subcosta simply forked before the end. Radial vein two-branched (left) or three-branched (right). Radial sector arising about in the middle of tegmen, forming a short, oblique cross vein which unites the radial stem with the fore branch of media. This is a character hitherto known only from venational type II; but the reduced venation brings this form into venational type III. The anterior basal cell is here quite half as long as the tegmen, the posterior one entirely wanting. In all the hitherto known species of venational type II, on the contrary, the posterior basal cell also is always present. If this remarkable type of venation should prove to be constant in the specimens from Mount Banahao, they should perhaps be considered as a different species. This united Rs + fore branch of media is three-branched or four-branched. Medial vein itself forked before the union with radial sector; the hind branch remains simple (right) or forked again (left). Following veins simple.

End of male abdomen (Plate 3, fig. 7) very similar to that of *immaculata* and differing by the same characters from the typical *plebeia.* Lobes of subgenital plate, however, somewhat more rounded than in *immaculata;* styles of the same shape, and broadly triangular.

Measurements of Gryllacris plebeia connexa subsp. nov.

Length.	Male. mm.
Body	21.5
Pronotum	5
Tegmina	18.5
Fore femora	7.3
Hind femora	13

Unfortunately, I have only one specimen of this form before me, so that I cannot say whether the described differences are constant or not.

Gryllacris brachyptera Gerstäcker. Plate 1, fig. 3.

Gryllacris brachyptera GERSTÄCKER, Arch. f. Nat. **26** (1860) 269; BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien **38** (1888) 331; KIRBY, Syn. Cat. Orth. **2** (1906) 140; GRIFFINI, Ann. Mus. Nat. Hungar. **11** (1913) 296, 304; Philip. Journ. Sci. § D **10** (1915) 65, 70; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 **15** (1915) 267.

I place with this species one female from Tangkulan, Bukidnon Province (*Baker*) which differs very slightly from Griffini's description (1913).

The lateral borders of fastigium verticis seem to be a little more acute than in Griffini's specimen. The black color of all tibiæ does not extend as far as in that species. Extreme base of all tibiæ ferruginous; then follows a broad black ring, ending on upper surface of fore and middle tibiæ, at end of first third of tibial length; remaining part ferruginous. In the hind tibiæ the black color extends a little beyond the middle of tibia. Shape of ovipositor and subgenital plate agrees perfectly with Griffini's description, and the latter I find is especially typical for this species.

As Griffini has given no data as to tegminal venation, I find it necessary to describe and figure it here (Plate 8, figs. 1 to 3). Subcosta simply forked, fore branch united before its tip with end of costal vein on right tegmen. Radial vein simply forked; radial sector three-branched or four-branched, arising basad from fore radial branch. Medial vein three-branched; fore branch remaining simple, on left tegmen entirely split up from hind branch as a separate stem, similarly as in the left tegmen of the *plebeia* male from Panay (see above); hind branch forked again, on left tegmen basad, on the right one distad from the middle of tegmen. Following veins simple.

Measurements of Gryllacris brachyptera Gerstäcker.

Length.	Female. mm.
Body	28.8
Pronotum	6.5
Tegmina	19.5
Fore femora	8.5
Hind femora	15.5
Ovipositor	15

Gryllacris brachyptera brevisector subsp. nov.

Male.—Rufo-testaceous, paler than the typical *brachyptera*, similar in color to *plebeia*, but somewhat larger and stouter than that species. Mandibles a little darkened at extreme tip, not black. Fastigium of vertex as in the female from Tangkulan. Ocellar spots yellow, small, not very distinct. Margins of clypeus not darkened. Pronotum shaped and sculptured as in the typical form, rufo-testaceous, without darker markings; lateral lobes more yellowish, with a fine dark margin in the neighborhood of hind angle. The dimple on the sides of disk near the hind margin[9] even larger and more distinct than in the female from Tangkulan. Legs yellowish ferruginous; the tibiæ only above and on sides with a black spot below knees, which is somewhat larger in hind tibiæ, here extending about to end of first fifth of their length. Spines of fore and middle tibiæ yellowish, on hind legs blackish, of the same number as in the typical form (Griffini, 1913), those on hind tibiæ with a black spot apposed at their bases. Male genitalia (Plate 3, fig. 8) very similar to those of *plebeia connexa;* subgenital plate with a semicircular blackish spot at base on each side, between them a narrow blackish crossband at extreme base.

Tegmina (Plate 7, figs. 3 and 4) very similar in shape and color to those of the typical form. Radial vein three-branched, radial sector reduced, arising distad to fore radial branch, simply forked. Medial vein three-branched; fore branch simple, on left tegmen separated nearly throughout, on right tegmen twice touching radial stem near its base; hind branch forked again, on left tegmen basad, on right one distad to middle of tegmen. Following veins simple.

Measurements of Gryllacris brachyptera brevisector subsp. nov.

Length.	Male. mm.
Body	22
Pronotum	6.4
Tegmina	20.6
Fore femora	9
Hind femora	15

One male from Tangkulan, Bukidnon Province (*Baker*).

As the male of *brachyptera* is not yet known, I have placed this form with *brachyptera,* where it belongs, following Griffini's key (1915), on account of the black spots of all tibiæ. It seems, however, also to be very near to *plebeia,* especially on account of the less-developed radial sector and the shape of end of abdomen in the male. It is not impossible that it would better be placed as a subspecies to *plebeia,* if the male genitalia of *brachyptera* should show considerable differences. This question cannot be decided at present, and I therefore place the specimen provisionally with *brachyptera* until males of the typical *brachyptera* shall be known.

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[9] Punctum impressum adest in vertice gibbulae posticae.—GRIFFINI.

Gryllacris fuscinervis Stål.

> *Gryllacris fuscinervis* STÅL, Oefv. Vet.-Akad. Förh. (10) **34** (1877) 47; BRUNNER V. WATTENWYL, Verh. zool.-bot. Ges. Wien **38** (1888) 334; NAVAS, Bol. Soc. Aragon. **3** (1904) 138 (*scripta*); KIRBY, Syn. Cat. Orth. **2** (1906) 140 (*scripta*), 141; NAVAS, Bol. Soc. Aragon. No. 5 **8** (1909) 103 (*scripta*); GRIFFINI, Atti Soc. It. Sci. Nat. **48** (1909) 88; Ann. Mus. Nat. Hungar. **11** (1913) 304; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 **15** (1915) 267 (*fuscinervis, scripta*); GRIFFINI, Philip. Journ. Sci. § D **10** (1915) 65, 69; Mon. Zool. It. No. 2 **29** (1918) 29.

This species belongs in Griffini's key (1915) with the group with "femora tota fulvo-testacea;" but I must place with the species two of the specimens before me in spite of their largely black legs, because the color of the pronotum does not agree with any species of the group with "genicula atrata, seu femorum apex et basis tibiarum atrata." This is in accordance with the fact that Griffini has in the meantime described a new variety of *fuscinervis,*[10] characterized by its "pedibus totis atris, excepto apice tibiarum cum tarsis fulvo et coxis ferrugineis." The typical *fuscinervis* was originally from Mindanao (type of Navas's *scripta,* whereas Stål has given for his type only the locality "Philippines"), the var. *diamantii* from Basilan, southwest of Mindanao. The two specimens before me seem to be about intermediate between *diamantii* and the typical *fuscinervis,* and were collected in northwestern Panay (*Baker*). I name them therefore:

Gryllacris fuscinervis panayensis var. nov. Plate 1, fig. 7.

Differing from the typical *fuscinervis* by the coloration and the somewhat larger size. All other characters as in *fuscinervis.* Ovipositor and female subgenital plate practically as in *brachyptera* ("genitalia ♀ ut in speciebus proximis" Griffini, 1918). Male subgenital plate and styles not visible in the specimen before me, because the end of abdomen is here mutilated, ninth tergite of male quite as described by Griffini (1909).

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[10] Var. *diamantii* Griffini, Mon. Zool. It. No. 2 **29** (1918) 29.

Measurements of Gryllacris fuscinervis panayensis var. nov.

Length.	Male.	Female.	Length.	Male.	Female.
	mm.	*mm.*		*mm.*	*mm.*
Body	25.5	28	Fore femora	7	8.5
Pronotum	5.4	6.2	Hind femora	13.2	16.3
Tegmina	17	21	Ovipositor	--------	15

Much darker than the typical form. Head blackish, occiput and clypeus paler, brown. Ocellar spots and the short stripes beneath them as in the typical form. Forehead entirely black in female, with a median longitudinal pale brownish stripe below inferior ocellar spot in male. Labrum darkened, especially along margins, mandibles blackish at tip. Pronotum with a large crescent-shaped, yellowish brown spot above fore angle of lateral lobes; otherwise entirely blackish. All femora brownish in basal part, black in distal half or third. All tibiæ black or blackish brown above, paler brown below. Tarsi brown, somewhat darkened above. Spines of fore and middle tibiæ entirely yellowish brown, those of hind legs black.

Venation of tegmina (Plate 6, figs. 1 and 2) similar to that in the preceding species, according to venational type III. With two or three precostal veins, very weak and feeble, pale, nearly hyaline; cross veins between them and between costal and subcostal veins of the same color. Both these darker, brown, simple, or the subcosta simply forked before apex. Radial vein two-branched or three-branched. Radial sector somewhat reduced, three-branched, arising in the male before me (on both sides) distad to first radial anterior branch, in the female basad from it on left tegmen, entirely wanting on the right one. Medial vein three-branched, as in the other species of venational type III here described, the anterior branch sometimes separated (female, left; male, right tegmen; in the latter united for some distance near base with radial stem). The anterior medial branch in right tegmen of the female before me, where the radial sector is wanting, three-branched before apex. It is certainly an anomalous development of this branch, being in connection with the reduction of radial sector; nevertheless, there is no oblique cross vein between radius and media, which could otherwise represent the base of radial sector. Following veins simple.

One male and 1 female from northwestern Panay (*Baker*) of which the female may be considered as the type of this variety; the female is somewhat darker than the male.

Gryllacris nigrogeniculata Brunner v. Wattenwyl. Plate 1, fig. 5.

Gryllacris nigrogeniculata BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien **38** (1888) 330; KIRBY, Syn. Cat. Orth. 2 (1906) 140 (*punctifrons*, partim); GRIFFINI, Atti Soc. It. Sci. Nat. **48** (1909) 96; Ann. Mus. Nat. Hungar. **11** (1913) 303; Philip. Journ. Sci. § D **10** (1915) 65, 69; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 **15** (1915) 267.

As there exists no description of this species other than the short one by Brunner, I must give some additional notes from the female before me. General appearance very similar to that of *plebeia* and *brachyptera*, quite different from *punctifrons*, as already stated by Griffini. Kirby's synonymy is, therefore, erroneous.

The black color of vertex forms an acute triangle on upper part of fastigium when seen from in front. Remaining part of anterior surface of fastigium testaceous. Suture between vertex and frontal fastigium distinct. Upper surface of head with occiput black throughout. Anterior surface of first and second antennal joints black; the following two or three joints entirely blackish, the others brown. Margins of antennal scrobes very finely blackish bordered, with a larger blackish spot at their inner, lower angle, produced into a blackish, hooklike stripe as far as the place where in *punctifrons* and *sexpunctata* the two lower black dots are situated. Furthermore, four other dots are also present, namely, one on each side of forehead, and two on upper part of clypeus. Eyes beneath and behind broadly blackish bordered. Genæ testaceous, subocular furrow visible in lower part only, broad and shallow. Clypeus smoky bordered. Mandibles and labrum blackish in distal part. Apical joint of palpi slightly thickened distad, that of labial palpi obliquely truncate at tip.

Shape and sculpture of pronotum similar to those of *plebeia* and *brachyptera*, not very distinct. Margins darkened for their entire extent. From anterior margin on each side of disk a large black spot, produced backward. Longitudinal sulcus blackish, in the shape of an arrowlike line. Posterior (ascending) branch of the V-shaped sulcus of lateral lobes black. Of the same color also is the dotlike dimple on sides of disk near hind margin, but smaller and less impressed than in *brachyptera brevisector*.

All veins of tegmina (Plate 6, figs. 3 and 4) (also the precostal ones!) dark rufocastaneous. Three precostal veins; costa and subcosta simple. Radial vein three-branched; sector reduced, arising far distad of middle and a little distad of first anterior branch, two-branched or three-branched. Medial vein at base running close behind radial stem but not united with it, forked before middle; anterior branch remaining simple, hind branch united with fore branch of cubital vein; this $M_2 + Cu_1$ simply forked, on right tegmen moreover with a short accessory branch before the fork. Hind branch of cubital vein simple. Anals simple, except the last two which arise from a relatively long common shaft. Venation of hind wings very similar to that of *brachyptera* (Plate 8, figs. 1 to 3), but radial vein and sector each four-branched (in *brachyptera* the former three-branched, the latter five-branched); first branch of radial sector arising close before middle (less basad than in *brachyptera*).

Legs as described by Brunner. Spines of hind femora pale at base, seventeen on inner, nine on outer edge. Ovipositor slightly curved, slender, less narrowed in distal part than in *plebeia* and *brachyptera*, obliquely truncate above at tip. Female subgenital plate with a short, basad-directed tooth at extreme base; hind margin obtusangulately triangular.

One female from Polillo (*Taylor*).

I place with this species also one male from Mount Maquiling, Luzon (*Baker*), although it does not quite agree with Brunner's description, having the lobes of ninth tergite furnished with sharp spines crossed with one another (Plate 4, fig. 12), whereas Brunner says: "lobis rotundatis, muticis." I must suppose that these spines were overlooked by Brunner or broken off in his type specimen. All other characters accord with Brunner's description and with the female here described.

Occiput with a large V-shaped tawny yellow marking. The two anterior black spots of pronotum not confluent with the broadly black fore margin (as in the female from Polillo), but distinctly separated therefrom by tawny yellow. Legs as in female; hind femora with eight spines on outer, thirteen to fifteen on inner edge. Tegminal venation (Plate 6, figs. 3 and 4) practically as in female. Radial sector very short, simple? (both tegmina being mutilated at extreme tip). Medial vein arising from base as a separate stem close to the radial one, then united with this for a distance of about three or four cross veins (on both tegmina!), then separated again; before the middle branched into a simple anterior branch or simply forked just before apex and an oblique cross vein uniting with the fore branch of cubitus. This $M_2 + Cu_1$ simply forked on both tegmina just distad of their juncture, hind branch of cubital vein simple. Anals as in female.

Measurements of Gryllacris nigrogeniculata Brunner v. Wattenwyl.

Length.	Mount Maquiling male.	Polillo female.	Length.	Mount Maquiling male.	Polillo female.
	mm.	*mm.*		*mm.*	*mm.*
Body	25	25.4	Fore femora	8.7	9
Pronotum	6	6.2	Hind femora	15.7	15.7
Tegmina	±20	20.4	Ovipositor	--------	12.3

Gryllacris nigrogeniculata tristis subsp. nov.

Very similar in size and general appearance to the typical *nigrogeniculata,* but widely different from it at first view by the large extension of black color.

Head shining black, except clypeus, palpi, and labrum which are tawny yellow, clypeus somewhat darker, brownish. Inferior ocellar spot small, well defined, elongate, yellowish, the upper ones not visible. Antennæ black in basal part, then gradually becoming fuscous. Pronotum tawny yellowish, black all around, the black color at the fore and hind margins somewhat produced on disk; otherwise no black markings.

Tegmina shining black, with black veins, yellowish hyaline in precostal and costal area, grayish in distal half along margins. In the paler parts of tegmen the veins also are black and narrowly bordered with black. Venation (Plate 7, figs. 1 and 2) similar to that of the typical form. The radial sector arising on left tegmen before first radial fore branch, on right tegmen entirely wanting. Medial vein on left tegmen simply forked a little basad of middle; on right tegmen both branches of chief fork forked again, the anterior branch somewhat before apex, the hind one near its base. Following veins simple. Hind wings cycloid, gray, with deeply black veins. Venation quite as in the typical form.

Femora as in the typical form; spines of hind femora black, with apposed black spots at their bases. All tibiæ shining black throughout; spines also black, with yellowish tips on fore and middle tibiæ. First tarsal joint black above, undersurface and the other joints tawny. Ovipositor of similar size and shape as in the typical form, but gradually narrowed to the acute tip, not obliquely truncate at apex. Female subgenital plate somewhat mutilated in the specimen before me; the shape seems, however, to be similar to that of the typical form.

Measurements of Gryllacris nigrogeniculata tristis subsp. nov.

Length.	Female. mm.
Body	21
Pronotum	5.5
Tegmina	18.4
Fore femora	8
Hind femora	14.2
Ovipositor	11.5

One female from Samar (*Baker*).

Gryllacris siderea sp. nov. Plate 1, fig. 2.

This name may be derived from the Greek *σίδζος*=iron, steel, because of its beautiful steel blue color; or from the Latin *sidera* =stars, because of its metallic splendor and of the coloration of the hind wings—like a starry sky—similar to that of the New Guinean *urania*.

A very small species. General color steel blue, antennæ and all legs bright orange yellow. Abdomen reddish brown, with a faint steel blue gleam.

Occiput and vertex strongly arched, steel blue. Fastigium verticis, when seen from in front, more than one and a half times as wide as first antennal joint, with protruding lateral margins below upper ocellar spots. Suture between vertex and frontal fastigium not discernible. Ocellar spots yellowish brown, the upper ones distinct, the lower ones larger, but not well defined. Genæ dark, with a slight metallic hue; subocular furrows broad and shallow, in the upper part very indistinct. Forehead reddish castaneous with a blackish band along clypeal margin and two dark longitudinal bands from inner lower angle of antennal scrobes to clypeal margin, the bands not well defined, nebulose. Mouth parts of usual shape, brown. Palpi brownish yellow. Apical joint of maxillary palpi linear, very slightly thickened distad; that of labial palpi very much enlarged, almost infundibuliform, obliquely truncate at end.

Pronotum slightly wider than long, entirely steel blue. Sculpture of the usual arrangement, but very slightly developed; the U-shaped sulcus of lateral lobes only sharp and deeply impressed. Margins of pronotum linear, protruding. Lateral lobes little appressed, much longer than high, with backward-descending lower margin; angles bluntly rounded. No humeral sinus. Hind margin of disk truncate. Above hind angle of lateral lobes an acute, thick, posteriorly directed, yellowish spine.

Sterna orange yellow; prosternum unarmed; mesosternal and metasternal lobes produced in a stout downward-directed spine.

All legs short and stout, uniformly orange yellow. Spines of fore and middle tibiæ unicolorous, yellowish, hardly longer than in *Gryllacris arctata* (Plate 4, fig. 6). Hind femora (Plate 4, fig. 7) extraordinarily wide and relatively short, below with about twelve short spines on each margin. Hind tibiæ slightly curved, above with seven spines on each margin, which are considerably longer than those of femora. All these spines of the hind legs with darker tips.

Tegmina uniformly steel blue. Venation somewhat reduced. One precostal vein; costal and subcostal vein simple, the area between them not wider than that between subcosta and radius. Radial vein simple; radial sector arising close behind middle, simply forked at apex. Medial vein simply forked about at end of first third. Following veins simple.

Hind wings cycloid, dark brown, nearly black. All cross veins, except those along the margins, surrounded by large, orange yellow spots; more than thirty such spots present on one wing. By this coloration, *siderea* reminds one of the New Guinean *urania,* but the orange spots are more numerous and relatively larger than in *urania.*

Eighth tergite a little longer than the preceding ones. Ninth tergite (Plate 4, fig. 8) large, arched, with a rectangular, concave impression in basal part (natural or perhaps a post-mortem deformation?) ; lower margin covered by the large subgenital plate, so that it is not possible to state with certainty whether there are long, crossed, almost horizontal spines present; but it seems that there are such (type A). Cerci moderately long, bristle-haired. Subgenital plate (Plate 4, fig. 9) extraordinarily large, transversely rectangular in basal part, then of the shape of a large, acutangular triangle, bluntly rounded at apex. Ventral surface with a fine longitudinal furrow and an obtusangulate cross sulcus. Styles short and very weak, inserted at base of triangular part of subgenital plate. Female unknown.

Measurements of Gryllacris siderea sp. nov.

Length.	Male. mm.
Body	16.5
Pronotum	4.7
Tegmina	12.3
Fore femora	5
Hind femora	8
Ninth tergite	1.7

One male from Butuan, Mindanao (*Baker*).

A very characteristic species, well distinguished from all others by its beautiful color and the remarkable shape of end of abdomen in the male. Its small size reminds one of the species of the *punctifrons* group.

VENATIONAL TYPE Vb [11]

When I first defined my five venational types [12] I knew of type V only species with very reduced, simple venation, like *navicula* and *fasciata*,[13] corresponding with Walker's genus *Larnaca*. Later I found in some species of this type [14] a venation differing from type IV by progressive reduction only, whereas the other characters were the same as in type IV, namely, medial vein united in basal part with radial stem. I named this venation "Va," in contrast with "Vb" in which the media arises from the cubital stem.[15] At that time [16] I thought it not impossible that Vb might perhaps be nothing more than a mere variety of Va, and this opinion was supported by the variability of *G. willemsei*.[17] At the present time, however, I believe such cases represent rare exceptions. In by far the most examples I found types Va and Vb rather constant and well differentiated from each other, especially in *pallidula* (Va) and *inconspicua* (Vb) and some similar species which I have before me in extensive material from Java, Buru, and the Key Islands. This material will be published in future papers in Treubia. For the present I will state only that most of the species of type Vb are not to be derived (in a phylogenetical sense) from Va but, I think, rather from III. *Gryllacris leefmansi* Karny shows very clearly the manner in which this evolution may have occurred. Here [18] the cubital vein is very closely approximated, in the basal part, to the medial stem, and it is easily conceivable that they may be quite united in a more-recent stage of evolution. This consideration is the reason why I place here Vb after III, not after IV. However, it will be a problem for further study to distinguish such species of type Vb as have originated from III from those originating from Va (like *willemsei*).

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[11] Treubia 5, Livr. 1–3 (1924) 52, 100.

[12] Schultze, L. Zool. Anthrop. Ergebn. Südafrika No. 1 4 (1910) 38.

[13] Treubia 5 (1924) 103, fig. 35.

[14] Treubia 5 (1924) 101, fig. 33, *pallidula*.

[15] Treubia 5 (1924) 102, fig. 34, *inconspicua*.

[16] Treubia 5 (1924) 100; Zool. Mededeel. 5 (1920) 151.

[17] Treubia 5 (1924) 230, fig. 85.

[18] Treubia 5 (1924) 70, fig. 28.

Gryllacris recticauda sp. nov. Plate 1, fig. 6.

Female.—General color dark yellowish brown. The greater part of head and of all tibiæ black. Ovipositor very dark blackish brown.

Head somewhat wider than pronotum; ovate, somewhat elongate, when seen from in front. Occiput and vertex strongly convex; fastigium of vertex, when seen from in front, somewhat wider than first antennal joint, with bluntly rounded lateral margins. Forehead shining, with fine impressed dots and with one larger dot below on each side; in the neighborhood of clypeus depressed, almost concave. Subocular furrows visible only in lower part as a broad triangular impression. Mouth parts of the usual shape. Apical joint of maxillary palpi distad a little widened, that of labial palpi somewhat more widened and obliquely truncate at end.

Occiput and genæ tawny brown. Vertex, eyes, and entire forehead black. Ocellar spots present, distinct, yellow, the upper ones narrow, ovate, the lower one larger, more than half as wide as the frontal fastigium, orbicular, well defined. No other pale spots or stripes between the ocellar ones. Antennal scrobes pale, tawny. First antennal joint and basal half of second one black; remaining ones tawny ferruginous. Mouth parts yellowish brown, apical joints of all palpi somewhat darkened at extreme tip.

Pronotum unicolorous, tawny brown, without any blackish longitudinal band on disk, with linear, protruding, somewhat darker ferruginous margins; half cylindrical in shape, when seen from above; somewhat longer than wide. Anterior margin slightly rounded, a little thickened; anterior cross furrow distinct, impressed. Longitudinal sulcus very shallow, forming two elongate dimples, one about in the middle of disk, the other farther behind. Hind cross furrow very indistinct, somewhat visible on sides, in the middle nearly absent. Hind margin slightly rounded, almost truncate. Lateral lobes much longer than high, little appressed; fore and hind angles rounded; lower margin straight, somewhat descending backward. No humeral sinus. The V-shaped sulcus and the oblique posterior one distinct, impressed. Space between them arched, on that above the posterior sulcus a little impressed dimple, similar to that in *nigrogeniculata* and *brachyptera*.

Tegmina (Plate 2, fig. 5) short, not reaching to end of abdomen. General color tawny yellowish in basal half, grayish hyaline distad; veins testaceous, a little darkened apically. With about four precostal veins; costa and subcosta simple. Radial vein simple on left, simply forked on right tegmen. Radial sector arising somewhat distad of middle, on left tegmen forked, both branches forked again, on right tegmen three-branched. Medial and cubital veins arising from a short common stem; on left tegmen each of them simply forked; on right tegmen media three-branched (anterior branch simple, hind branch forked again), cubitus simple. Anals simple. Hind wings cycloid, grayish hyaline, with darker veins.

Legs moderately stout, haired. All femora tawny throughout. Fore and middle tibiæ black in basal part, yellowish brown in distal, the black color reaching to middle on undersurface to beginning of apical fourth on upper surface. All spines yellowish. Hind femora on outer margin with nine, on inner with fifteen spines, which are blackish at apex. Hind tibiæ with seven spines on each side; black from knee to last spine, remaining apical part tawny; spines black at base and at apex, brownish in their middle. All tarsi tawny brown.

Abdomen dark brown. Cerci relatively short. Ovipositor straight throughout, narrow, gradually narrowing from base to tip, subacute at apex. Female subgenital plate with basad reflexed hind margin, similar to that in *fuscinervis* and *brachyptera;* but, besides the rounded median lobe, there is on each side a more projecting, subacute, toothlike lateral lobe.

Measurements of Gryllacris recticauda sp. nov.

Length.	Female. mm.
Body	26.5
Pronotum	5.2
Tegmina	15
Fore femora	7
Hind femora	13.7
Ovipositor	13.3

One female from Kolambugan, Mindanao (*Baker*).

This new species comes close to *fuscinervis,* in Griffini's key (1915), but differs from it by the color of head and pronotum, the tegminal venation, the straight ovipositor and the shape of the female subgenital plate.

Key to the species allied with Gryllacris punctifrons Stål.

a^1. Tegmina about one-fourth longer than hind femora, their veins dark. Vertex without darker markings. Spines of hind femora black. (Ceram, Moluccas.) .... G. sexpunctata Brunner v. Wattenwyl.

a^2. Tegminal veins pale, tawny.

  b^1. Pronotum with well-defined black markings. Vertex with a blackish spot.

    c^1. Occiput and all tibiæ unicolorous, testaceous. (Batjan, Moluccas.) G. leefmansi Karny.

    c^2. Occiput with a large V-shaped blackish marking. All tibiæ above with a blackish annuliform spot near base. (Mindanao, Philippines.) .... G. melanosticta sp. nov.

  b^2. Pronotum concolorous, tawny brown, sometimes a little nebulous, never with sharp, black markings.

    c^1. Hind tibiæ black in basal half. (Samar, Philippines.) G. samarita sp. nov.

    c^2. Hind tibiæ tawny, their spines somewhat darker brown, black at apex.

      d^1. Tegmina reaching to end of abdomen. Northwestern Panay, Philippines.) .... G. modesta sp. nov.

      d^2. Tegmina distinctly shorter, not reaching end of abdomen. Females only known.

        e^1. Female subgenital plate almost square, with thickened lateral margins. (Barrio de Biting, Philippines.) G. punctifrons Stål.

        e^2. Lateral margins of female subgenital plate converging backward, not conspicuously thickened.

          f^1. Female subgenital plate transverse, with broadly obtusangulately emarginated hind margin. (Negros, Philippines.) G. emarginata sp. nov.

          f^2. Female subgenital plate acutely triangular, pointed at tip.

            g^1. Vertex dark spotted. Radial vein simple, without any sector. Female subgenital plate finely black margined. (Mount Maquiling, Luzon, Philippines.) G. privata sp. nov.

            g^2. Vertex concolorous, tawny. Radial sector arising about in the middle of tegmen from radial vein. Female subgenital plate not darker bordered. (Polillo, Philippines.) .... G. sectoralis sp. nov.

Gryllacris melanosticta sp. nov.

Male.—Differing from *punctifrons* Stål by the following characters: Occiput infuscated at extreme base, in anterior part furnished with a large, blackish, V-shaped stripe. Vertex with a blackish, anteriorly bifid spot. Besides the six blackish dots described for *punctifrons*, there are four other, smaller ones, forming with the two lower of the six dots a subregular hexagon: one on each side of lower part of front and two in upper part of clypeus. The first three antennal joints blackish at base.

Pronotum with blackish markings: one arrow-shaped at the longitudinal sulcus, one on each side of fore part of disk at the place where in *signifera* the widened part of the 7-shaped spot is situated; one at the inferior angle of V-shaped sulcus of lateral lobes, and one or two in the hind discal dimple, as in *nigrogeniculata.* Hind wings hyaline, without a rosy tinge. On all tibiæ below the knees a small blackish spot on upper surface. Hind femora on outer margin with seven spines; those on inner margin more numerous, but very small. Spines of hind tibiæ, six on each side, black, with apposed black spots at their bases.

Tegmina (Plate 5, figs. 1 and 2) pale yellowish, veins testaceous, a very little darker brown in distal part. Four precostal veins, on right tegmen the last one united at base with costa; this and subcosta simple. Radial vein simple; sector arising somewhat distad of middle, simply forked. Medial and cubital veins united in basal part to a common stem; media simply forked before apex, cubitus before middle of tegmen. Anals simple.

Eighth tergite produced, more than twice as long as seventh. Ninth tergite also produced, a little shorter than the preceding one, cucullate, arched, with a median impression in lower (distal) part, and on each side of it somewhat globosely inflated; at apical margin with two dark, short, blunt, crossed spines. Cerci moderately long. Subgenital plate (Plate 3, fig. 9) short and wide, bluntly excised at apical margin, with obtusangulate lobes; on each side furnished with a slender style.

Measurements of Gryllacris melanosticta sp. nov.

Length.	Male. mm.
Body	17
Pronotum	4
Tegmina	13.3
Fore femora	4.7
Hind femora	9.2

One male from Kolambugan, Mindanao (*Baker*).

Gryllacris samarita sp. nov.

Male.—Differing from *punctifrons* by the following characters: Occiput and vertex tawny brown, concolorous, without darker markings. Besides the typical six black dots, there are also the two lower frontal dots, as in *melanosticta,* but those on clypeus not visible. Labrum darker, brown, almost black at apex. Antennæ concolorus. Pronotum unicolorous tawny, without black markings, indistinctly nebulous on disk. Anterior cross furrow throughout (even in middle part) more distinct than posterior. Hind wings hyaline, with dark brown veins. Spines of fore and middle tibiæ rather long. Spines of hind femora black, with apposed black spots at their bases; on outer margin six or seven, on inner, eight. Hind tibiæ shining black in basal half, tawny yellow in apical part; spines black in the black part, brownish with darker tips in the yellowish part.

Tegmina (Plate 5, fig. 3) yellowish, veins tawny yellow. Venation reduced, as in *fasciata* Walker. Two precostals; costa, subcosta, radius, and radial sector simple, the latter arising on left tegmen in apical part, on right tegmen before middle. Medial vein three-branched on left tegmen (anterior branch remaining simple, hind branch forked again), simply forked on right tegmen. Cubital vein simple, united with media at extreme base to a common stem. Then follow eight simple anals.

Eighth tergite comparatively shorter than in the preceding species. Ninth tergite of a similar shape as in that species, but with a deep and broad longitudinal furrow; at distal margin, I cannot distinguish any spines. Subgenital plate (Plate 3, fig. 10) of a shape similar to that of *melanosticta*, but the emargination more rounded; styles inserted at the tips of the lobes.

Measurements of Gryllacris samarita sp. nov.

Length.	Male. mm.
Body	17.8
Pronotum	4.5
Tegmina	12.2
Fore femora	5.7
Hind femora	10.7

One male from Samar (*Baker*).

Gryllacris modesta sp. nov.

Male.—Differs from *punctifrons* by the following characters: Vertex with an indistinct, nebulous, dark brown spot above. Occiput concolorous. The six dots on forehead as in *punctifrons*, the others, the lower ones (present in both preceding species), not visible. Labrum dark brown except at base, where it is yellowish. Pronotum vaguely nebulous, not distinctly infuscate in the middle. Tegmina practically as in the preceding species (Plate 5, fig. 3): two precostals, the second one on right tegmen, united at base with costal vein. Radial sector simple, arising from radius much more basad than in the preceding species, about at end of first fourth; radial vein simple on right tegmen, simply forked before apex on left tegmen. Media simply forked, on right tegmen before middle, on left tegmen close before apex. Cubital vein simple, united at base with medial stem. Anals eight, simple. Hind wings cycloid, hyaline. Spines of fore and middle tibiæ relatively long. Spines of hind legs blackish at apex, without darker spots apposed to their bases; on hind femora six or seven spines on each margin; on hind tibiæ six on outer edge, five on inner. Ninth tergite of male with a large triangular impression in basal half; apical margin rounded, slightly emarginate in middle. Male subgenital plate (Plate 3, fig. 11) longer and narrower than in both preceding species, semicircularly emarginated at apex, with slender styles inserted at tip of lobes.

Measurements of Gryllacris modesta sp. nov.

Length.	Male. mm.
Body	18.7
Pronotum	4.3
Tegmina	13.4
Fore femora	6
Hind femora	10.3

One male from northwestern Panay (*Baker*).

Gryllacris emarginata sp. nov.

Female.—Differing from *punctifrons* by the following characters: Occiput and vertex indistinctly darker nebulous. Besides the six typical spots on forehead, two lower ones are also present, as in *samarita,* clypeal ones wanting. Labrum and mandibles somewhat darkened along the margins. Pronotum concolorous, not infuscate on disk. Tegmina not reaching to end of abdomen, otherwise practically as in both preceding species. Radius and its sector simple, the latter arising on both tegmina basad of middle, on right tegmen united again with radial vein for a short distance. Medial and cubital veins united at extreme base to a common stem, the former on left tegmen simple, on right tegmen simply forked before middle; cubitus simple on right tegmen, simply forked a very little distad of middle on left tegmen. Anals eight, simple. Legs as in the preceding species. Spines of hind femora, six or seven on outer margin, twelve to fourteen on inner; number on tibiæ as in *modesta.* Ovipositor as described by Griffini (1909) for *punctifrons.* Female subgenital plate (Plate 3, fig. 12) trapezoidal, wider than long, obtusangulately emarginated at apical margin, with bluntly rounded lobes.

Measurements of Gryllacris emarginata sp. nov.

Length.	Male. mm.
Body	23.3
Pronotum	4.7
Tegmina	13
Fore femora	7
Hind femora	12.8
Ovipositor	13.4

One female from Cuernos Mountains, Oriental Negros (*Baker*).

This species, by the shape of the female subgenital plate, comes nearest to Stål's type specimen of *punctifrons*, as described by Griffini, 1909 ("Lamina subgenitalis ♀ verisimiliter subquadrata, pubescens, lateribus externis crassiusculis"). It does not, however, quite agree with this description in the details of structure, so that I think it must be separated as a different species. Later (1913, 1918) Griffini described under the same name some *Gryllacris* specimens from Luzon having the female subgenital plate triangular, acutely pointed at tip. He was mistaken in his earlier statement (1909) that "apex abdominis in typo est laesus;" therefore, he thought later that his original description of Stål's type was not accurate. As I now see that there are valuable differences in the shape of subgenital plates in specimens from different islands, I cannot agree therewith and, on account of this character, I believe that Stål's species is different from the Luzon specimens. The latter very probably belong to the following species, if not perhaps to *sectoralis;* this point cannot be decided with certainty, as Griffini says nothing of the tegminal venation of his specimens. Stål's specimen came from "Philippinae, Barrio de Biting;" unfortunately, I cannot find on my maps any place of this name.

Gryllacris privata sp. nov.

Gryllacris privata ? GRIFFINI, Boll. Mus. Zool. Anat. Torino, No. 668 28 (1913) 6 (*punctifrons*, nec Stål); Mon. Zool. It. No. 2 29 (1918) 32 (*punctifrons*, nec Stål).

Female.—Differing from *punctifrons* by the following characters: Occiput concolorous. Vertex with an irregular dark spot above. Eight spots on forehead, as in *emarginata* and *samarita*. Labrum dark along margins, except the basal one where it is pale. Pronotum concolorous, not infuscated. Tegmina short, yellowish, similar as in *samarita* (Plate 5, fig. 3), but without any radial sector. With one or two precostals; following veins simple. Media simply forked before middle, united at base with the simple cubitus. Anals seven, simple. Legs as in the preceding species, but on inner margin of hind femora eight spines only. Ovipositor practically as in the preceding species. Female subgenital plate (Plate 3, fig. 13) triangular, acutely pointed in apical half, with fine dark margins.

Measurements of Gryllacris privata sp. nov.

Length.	Female. mm.
Body	19.5
Pronotum	4.7
Tegmina	11.3
Fore femora	5.8
Hind femora	10.4
Ovipositor	11

One female from Mount Maquiling, Luzon (*Baker*).

By the shape of female subgenital plate very near to the following species, but differing from it by tegminal venation.

Gryllacris sectoralis sp. nov.

Female.—Differing from *punctifrons* by the following characters: Occiput and vertex concolorous. Blackish dots on forehead as in the preceding species; besides the six typical ones also two lower, frontal dots. Labrum concolorous, pale throughout. Pronotum concolorous, not darkened. Tegmina short, yellowish. Two precostals, on right tegmen arising from a short common stem. Costa and subcosta simple. Radial vein simple on right tegmen, simply forked in apical part on left tegmen. Radial sector on both tegmina present, simple, on left tegmen arising before middle; on right tegmen behind middle of tegmen, united for a short distance, about in middle of sector, with medial anterior branch. Media simple on left tegmen, simply forked distad of middle on right tegmen, united at base with the simple cubitus; this common stem, M + Cu, longer on left than on right tegmen. Anals seven, simple. Hind wings cycloid, grayish hyaline. Legs as in the preceding species; hind femora on outer margin with five spines in distal half only, unarmed in basal half; on inner margin with eight to ten spines. Ovipositor and female subgenital plate (Plate 3, fig. 14) practically as in *privata*, but subgenital plate without dark margins in *sectoralis* and a little slenderer and more strongly produced distad than in *privata*.

Measurements of Gryllacris sectoralis sp. nov.

Length.	Female. mm.
Body	18.2
Pronotum	4.7
Tegmina	11.3
Fore femora	6
Hind femora	11.5
Ovipositor	11

One female from Polillo (*Taylor*).

Very near to the preceding species; if further material should show that the difference in the tegminal venation is not constant, I should prefer then to consider *sectoralis* as a subspecies or variety of *privata*. In general, Polillo agrees as to its gryllacrid fauna with Luzon more than with any other island.

VENATIONAL TYPE IV [19]

Gryllacris maculipennis Stål.

Gryllacris maculipennis STÅL, Oefv. Vet.-Akad. Förh. No. 10 34 (1877) 47; BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 348; KIRBY, Syn. Cat. Orth. 2 (1906) 143; GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 78; Rev. Suisse Zool. No. 2 17 (1909) 390 (*masculipennis*); Atti Soc. It. Sci. Nat. 49 (1910) 14; Boll. Mus. Zool. Anat. Torino No. 668 28 (1913) 5; Philip. Journ. Sci. § D 10 (1915) 63, 67; BRUNER, UNIV. of Nebraska Stud. Lincoln No. 2 15 (1915) 268; GRIFFINI, Mon. Zool. It. No. 2 29 (1918) 23.

Gryllacris maculipennis laticauda subsp. nov. Plate 1, fig. 8.

Female.—Larger than *maculipennis* and *maculipennis bakeri.* Fastigia without ocellar spots. Longitudinal sulcus of pronotum visible, but not very much impressed. Tegminal venation of the usual type IV. With three or four precostals, the last of these not reaching fore margin, but close before it ending in a bluntly rounded angle at a cross vein which connects it with costal vein. Costa and subcosta simple; the latter strongly approximated to radius a little before end, then diverging from it again. Radial vein two-branched or three-branched. Radial sector arising a little before the middle of tegmen, two-branched or three-branched. Medial vein arising from radius basad of radial sector, simple throughout. Cubitus not united at base with radial stem, simply forked before middle. Anals five, simple. The metallic blue basal spot very large, 15 millimeters long, reaching in length from base of tegmen to first cross vein behind end of last precostal, in width from fore margin to radial stem; along fore margin only a very narrow stripe at base, before first precostal, yellowish hyaline; in precostal area all cross veins of the same metallic blue as the spot; behind costa the cross veins ferruginous and surrounded by the same color; in this manner the large spot is interrupted in this portion by yellowish. The dark spots in distal part of tegmen arranged as in *bakeri*, with a metallic blue gleam. Hind wings practically as in *maculipennis* and *maculipennis bakeri*. Legs as in the typical species, but hind tibiæ on each side with seven spines. Ovipositor of a shape unusual in this genus; well compressed, widest about in middle, blunt at tip. Female subgenital plate (Plate 4, fig. 11) almost pentagonal, blunt, and slightly emarginated at apex. Preceding sternite produced distad into two obtuse angles, broadly emarginated between them.

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[19] Treubia 5, Livr. 1–3 (1924) 51, 71.

Measurements of Gryllacris maculipennis laticauda sp. nov.

Length.	Female. mm.
Body	39
Pronotum	7.5
Tegmina	30.2
Fore femora	14
Hind femora	22.3
Ovipositor	19.8

One female from northwestern Panay (*Baker*).

By the absent ocellar spots, the coloration of tegmina, and the shape of female subgenital plate nearer to *maculipennis bakeri* than to the typical *maculipennis*, differing from both by its considerably larger size and the unusual shape of the ovipositor.

Gryllacris maculipennis specularis subsp. nov.

Male.—Smaller than typical *maculipennis*, of a paler, tawny yellow tinge. Ocellar spots present as in typical *maculipennis* (Griffini, 1909); the lower one very well defined, in shape and size quite as in *podocausta*, but not surpassing upward the suture between frontal fastigium and vertex. Labrum dark ferruginous, except at base where it is pale yellowish. Basal antennal joints also pale yellowish. The two black dots at antennal scrobes present, as in *maculipennis*. Pronotum pale, tawny, without darker spots; longitudinal sulcus more distinct than in *laticauda*. Tegminal venation (Plate 8, fig. 4) practically as in *laticauda*, but radial sector arising about at end of second third of tegminal length. Medial vein (on both tegmina) doubled, namely, two separated, simple branches arising from radial stem basad of radial sector. This arrangement reminds one at first view of the venation of *G. lineolata*,[20] but is quite different from it in a morphological sense, as in *specularis* both branches represent the medial vein, whereas in *lineolata* the first one is the cubitus, the second only the media. In *specularis*, there is behind it a free cubitus, arising from tegminal base, forked before middle, on right tegmen both branches remaining simple, on left one the fore branch being forked again. Anals five, the last two arising from a relatively long common stem. The large metallic blue basal spot smaller than in *laticauda*, 6 millimeters long, beginning at second cross vein between last precostal and costal vein, otherwise extended about as in *laticauda*. Between fore margin and last precostal the cross veins whitish hyaline and surrounded by the same color: the blue spot, therefore, does not reach to fore margin, as in *laticauda;* cross veins between last precostal and costal vein only of the same blue color, behind costa as in *laticauda*. The distal spots arranged as in that species, but somewhat less dark. Hind wings as in *maculipennis*. Legs as in the typical species. Hind femora with nine or ten spines on outer margin, eight or nine on inner. Hind tibiæ with six spines on inner edge, six or seven on outer. End of male abdomen (Plate 4, fig. 10) practically as in *maculipennis* (Griffini, 1909, p. 80); the spines of ninth tergite directed downward at base, then strongly curved upward and crossed with another in this ascending part.

Measurements of Gryllacris maculipennis specularis subsp. nov.

Length.	Male. mm.
Body	21.2
Pronotum	5
Tegmina	21
Fore femora	9
Hind femora	14

One male from Mount Maquiling, Luzon (*Baker*).

Coming nearest to typical *maculipennis*, differing from it by the considerably smaller size and the smaller basal spot of tegmina. The doubled media may perhaps also be a character of importance, but this is not yet certain, as only one specimen of *specularis* is known, and of *maculipennis* and *bakeri* the venation is not yet described. From *bakeri* and *laticauda* it differs by the same characters as does typical *maculipennis*.

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[20] Treubia 5, Livr. 1–3 (1924) 91, fig. 30.

Gryllacris nasalis Walker.

Gryllacris nasalis WALKER, Cat. Derm. Salt. Brit. Mus. 1 (1869) 183; STÅL, Oefv. Vet.-Akad. Förh. No. 10 34 (1877) 47 (*biguttata*); BRUNNER v. WATTENWYL, Verh. zool.-bot. Ges. Wien 38 (1888) 346 (*biguttata*); KIRBY, Syn. Cat. Orth. 2 (1906) 141 (*nasalis*), 143 (*biguttata*); GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 74 (*biguttata*); Rev. Suisse Zool. No. 2 17 (1909) 390 (*biguttata*); Atti Soc. It. Sci. Nat. 49 (1910) 14 (*biguttata*); Wien. Ent. Zeit. No. 10 32 (1913) 239 (*biguttata*); Philip. Journ. Sci. § D 10 (1915) 64, 68; BRUNER, UNIV. of Nebraska Stud. Lincoln No. 2 15 (1915) 267 (*nasalis*), 268 (*biguttata*).

Gryllacris nasalis sibuyana subsp. nov. Plate 1, fig. 4.

Female.—Differing from the typical species by the following characters (after Griffini's description, 1909): Pronotum shining black, bordered with tawny brown, the pale margin about 1 millimeter wide. Disk not paler than lateral humps. Tegmina, especially in anterior distal portion, with some dark spots in the centers of the cells. The dark bands of hind wings more than twice as wide as the pale stripes between them. Tibiæ not darkened, their spines of equal size on inner and outer margin, not darker before the tips. Hind femora with six to eight spines on both margins. Hind tibiæ six-spined on both margins.

As Griffini says nothing of venation, I add that it is arranged according to the usual type IV. Costal vein simple; subcosta simply forked before apex; radial vein three-branched; radial sector arising close before the middle of tegmen, three-branched; media arising from radial stem about at end of first third of tegminal length, simple; cubital vein three-branched (anterior branch forked again, hind branch simple); anals six, simple. Base of hind wings as figured for *fuscifrons*.[21]

Measurements of Gryllacris nasalis sibuyana subsp. nov.

Length.	Female. mm.
Body	36.5
Pronotum	8.2
Tegmina	34.2
Fore femora	11.2
Hind femora	19.7
Ovipositor	12.5

One female from Sibuyan (*Baker*).

Differing from the typical species by the black disk of pronotum, by the larger extent of fuscous color on hind wings (compare Griffini's figure, 1915, with that given here on Plate 1, fig. 4), and by the somewhat shorter ovipositor. By the coloration of pronotum, it runs to Griffini's key of the "hyalino-fasciatae" (1910) to group H (*moestissima* and *loriae*), while differing from this group by the color of head, which agrees with *nasalis*. This is a fact of zoögeographical importance, as the typical *nasalis* is known from Luzon (Manila), while *sibuyana*, originating from the more southerly situated island Sibuyan, resembles somewhat the Moluccan *moestissima*.

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[21] Treubia 5 (1924) 55, fig. 23.

Gryllacris nasalis var. **detersa** Griffini.

> *Gryllacris nasalis* var. *detersa* GRIFFINI, Wien. Ent. Zeit. 32 (1913) 241 (*biguttata* var. *detersa*); BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 268 (*biguttata* var. *detersa*); GRIFFINI, Philip. Journ. Sci. § D 10 (1915) 64, 68; Mon. Zool. It. No. 2 29 (1918) 24.

One female from Los Baños (*Baker*) agrees perfectly with Griffini's description of this variety (male, 1913; female, 1918). Tegminal venation practically as described for *sibuyana;* radial sector three-branched or four-branched; cubital vein simply forked before middle (on both tegmina). The gray spots on hind wings rather pale. Hind femora with seven spines on outer, five or six on inner margin; hind tibiæ with six spines on outer, five or six on inner margin.

Measurements of Gryllacris nasalis var. detersa Griffini.

Length.	Female. mm.
Body	26.5
Pronotum	6.5
Tegmina	26
Fore femora	9.3
Hind femora	15.4
Ovipositor	11.8

Gryllacris pustulata Stål.

> *Gryllacris pustulata* STÅL, Oefv. Vet.-Akad. Förh. No. 10 34 (1877) 47; KIRBY, Syn. Cat. Orth. 2 (1906) 145; GRIFFINI, Atti Soc. It. Sci. Nat. 48 (1909) 82; Ann. Mus. Nat. Hungar. 11 (1913) 292; Philip. Journ. Sci. § D 10 (1915) 63, 66; BRUNER, Univ. of Nebraska Stud. Lincoln No. 2 15 (1915) 268; GRIFFINI, Mon. Zool. It. No. 2 29 (1918) 24.

Key to the subspecies of Gryllacris pustulata Stål.

a^1. Head, pronotum and legs ferruginous.
  b^1. Inferior ocellar spot small and not very distinct........ **G. pustulata** Stål.
  b^2. Inferior ocellar spot large, occupying almost the whole frontal fastigium.. **G. p. ocellaris** subsp. nov.

a^2. Head, pronotum, and legs in large part blackish.

b^1. Head black, the occiput and a part of genæ only castaneous. Pronotum black, lateral humps castaneous. Fore femora black beneath and above, castaneous at sides. All tibiæ blackish.
G. p. mindorensis Griffini.

b^2. Occiput, hind part of genæ, vertex, frontal fastigium, and a frontal spot testaceous; mouth parts (except palpi) and forehead black. Pronotum testaceous, black bordered. Legs testaceous, knees black; fore tibiæ, apex of middle and hind tibiæ, and all tarsi dark brown.
G. p. luzoniana Griffini.

Gryllacris pustulata ocellaris subsp. nov.

Female.—Very near to typical *pustulata,* from which it differs by the following characters: Inferior ocellar spot large, yellow, not very well defined, occupying almost the whole frontal fastigium. Clypeus somewhat paler than forehead, yellowish. Antennæ not darker at base. Cross veins in distal part of tegmina somewhat darkened, but not conspicuously bordered with dark; those in anterior part of hind wings distinctly bordered with blackish. Remaining part of hind wings grayish, all cross veins distinctly blackish bordered, within all areas a large whitish hyaline spot, also in basal and marginal areas! These spots are circular behind middle, becoming elliptical in middle of hind wings, then basad still more elongate, finally in basal areas occurring as very narrow, radiate stripes; but present everywhere, not in the middle wing part only, as noted by Griffini for *pustulata* (typ.). Hind femora on each margin with seven to nine spines; spines of hind tibiæ six or seven on outer edge.

Tegminal venation not yet known for *pustulata.* In the specimen before me it agrees with type IV, practically as in the preceding species: subcosta and radial vein simply forked, radial sector three-branched, media simple, cubital vein simply forked before middle; anals five, on left tegmen the last two arising from a very short common stem, on right tegmen the last (fifth) anal simply forked about in the middle of its length. Hind wings as usual in type IV.

Measurements of Gryllacris pustulata ocellaris subsp. nov.

Length.	Female. mm.
Body	28.5
Pronotum	8.8
Tegmina	32
Fore femora	10.8
Hind femora	19.4
Ovipositor	19.5

One female from Samar (*Baker*).

Resembles *nigrilabris* as to coloration of hind wings, differing from it by the somewhat smaller size, the shorter ovipositor, and the pale labrum. Also very similar to *obscura,* especially its var. *javanica.* Comparing *ocellaris* and *javanica,* the specimen mentioned in Treubia 5 (1924) 81, I found a considerable difference in the shape of clypeus and labrum, which in *obscura javanica* (Plate 10, fig. 7) are wide and very short, in *pustulata ocellaris* slender and much longer (Plate 10, fig. 4), practically as in *nigrilabris* (Plate 10, fig. 5). The specimen recorded in Treubia 5 (1924) 233, which I would now place rather in *obscura,* also has clypeus and labrum very wide and short (Plate 10, fig. 6), although not as much so as in *javanica.* As I had before me only a male of each of the latter, and of *pustulata ocellaris* and *nigrilabris* only females, I at first thought that this difference might perhaps be merely a sexual character; but on comparing extensive Javanese material of both sexes of *fuscifrons* and *signifera,* I found that in all of them the shape of the clypeus and the labrum is practically the same as in *pustulata ocellaris* and *nigrilabris.* I expect therefore it will prove a character of specific importance, as there is no sexual difference in the two Javanese species.

The following species of venational type IV are not from the Philippine Islands.

Gryllacris nigrilabis Gerstäcker.

Gryllacris nigrilabris GERSTÄCKER, Arch. f. Nat. 26 (1860) 262; KARNY, Treubia 5 Livr. 1–3 (1924) 81 (with list of literature).

One female from Sandakan, Borneo (*Baker*). Labrum black (Plate 10, fig. 5).

Measurements of Gryllacris nigrilabris Gerstäcker.

Length.	Female. mm.
Body	38.7
Pronotum	8.8
Tegmina	36.5
Fore femora	13.5
Hind femora	23.7
Ovipositor	29

Venation as described in Treubia. Radial sector two-branched or three-branched.

Gryllacris discoidalis subsp. atropicta Griffini.

Gryllacris discoidalis subsp. *atropicta* KARNY, Journ. R. As. Soc. Mal. Br. No. 87 1 (1923) 124 (with list of literature).

Venation practically as in the preceding species. Subcosta simply forked before apex; radial vein three-branched; radial sector five-branched; media simple; cubitus simply forked before the middle; anals five, simple. Female subgenital plate very elongate, much longer than wide, excised at apex, much longer and narrower than in all allied species, namely: 4.2 millimeters long; 3.5 wide at base, 1.5 in the middle, 1.2 at apex.

One female from Singapore (*Baker*).

I place in the same species a male larva from the same locality, with black hind wing cases, as in *signifera*.[22]

Gryllacris maculata var. nobilis Walker. Plate 1, fig. 1.

Gryllacris maculata var. *nobilis* KARNY, Journ. R. As. Soc. Mal. Br. No. 87 1 (1923) 126 (with list of literature).

One female from Singapore (*Baker*) without darker spots in distal part of tegmina. The specimen is a small one and agrees rather with the measurements given by Brunner, 1888, and by Griffini, 1914; tegmina (31.4 millimeters long) and ovipositor (29 millimeters) still shorter. The specimens in Raffles Museum (Karny, 1923) are considerably larger, about the same size as the males recorded by Griffini, 1909 (length of body up to 40 millimeters), the ovipositor 32.7 millimeters long. Otherwise they are not different from the female of Baker's collection, except in the presence of many dark spots on tegmina.

[22] Treubia 5 (1924) pl. 2, fig. 5.

ILLUSTRATIONS

PLATE 1

FIG. 1. *Gryllacris maculata nobilis* Walker, × 5/6; del. Mas Siswo Amidjojo.
2. *Gryllacris siderea* sp. nov., × 5/3; del. Soehanam.
3. *Gryllacris brachyptera* Gerstäcker, × 5/6; del. Mas Siswo Amidjojo.
4. *Gryllacris nasalis sibuyana* subsp. nov., × 5/6; del. Raden Soedirman Atmosaprodjo.
5. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, × 5/4; del. Soehanam.
6. *Gryllacris recticauda* sp. nov., × 5/6; del. Mas Siswo Amidjojo.
7. *Gryllacris fuscinervis panayensis* var. nov., × 5/6; del. Mas Siswo Amidjojo.
8. *Gryllacris maculipennis laticauda* subsp. nov., × 5/6; del. Raden Soedirman Atmosaprodjo.

PLATE 2

FIG. 1. *Gryllacris pictipes* sp. nov., male, lateral view, natural size; del. Soedirman.
2. *Gryllacris pictipes* sp. nov., head and pronotum, dorsal view. × 2; del. Soedirman.
3. *Gryllacris arctata* Walker, tegmen.
4. *Gryllacris arctatiformis* sp. nov., tegmen.
5. *Gryllacris recticauda* sp. nov., tegmen.

PLATE 3

FIG. 1. *Gryllacris pictipes* sp. nov., tegmen.
2. *Gryllacris arctata* Walker, female, subgenital plate.
3. *Gryllacris arctata* Walker, male, end of adbomen, posterior aspect.
4. *Gryllacris arctatiformis* sp. nov., female, subgenital plate.
5. *Gryllacris plebeia* (typica) Stål, male, subgenital plate.
6. *Gryllacris plebeia immaculata*, male, subgenital plate.
7. *Gryllacris plebeia connexa* subsp. nov., male, subgenital plate.
8. *Gryllacris brachyptera brevisector* subsp. nov., male, subgenital plate.
9. *Gryllacris melanosticta* sp. nov., male, subgenital plate.
10. *Gryllacris samarita* sp. nov., male, subgenital plate.
11. *Gryllacris modesta* sp. nov., male, subgenital plate.
12. *Gryllacris emarginata* sp. nov., female, subgenital plate.
13. *Gryllacris privata* sp. nov., female, subgenital plate.
14. *Gryllacris sectoralis* sp. nov., female, subgenital plate.

PLATE 4

FIG. 1. *Gryllacris arctatiformis* sp. nov., hind femur. Figures 1 to 6 are drawn to the same scale.
2. *Gryllacris arctata* Walker, hind femur.
3. *Gryllacris arctatiformis* sp. nov., pronotum, lateral view.
4. *Gryllacris arctata* Walker, pronotum, lateral view.
5. *Gryllacris arctatiformis* sp. nov., fore tibia.
6. *Gryllacris arctata* Walker, fore tibia.
7. *Gryllacris siderea* sp. nov., hind femur.
8. *Gryllacris siderea* sp. nov., male, end of abdomen, posterior view.
9. *Gryllacris siderea* sp. nov., male, end of abdomen, ventral view.
10. *Gryllacris maculipennis* subsp. *specularis* subsp. nov., male, end of abdomen, ventral view.
11. *Gryllacris maculipennis* subsp. *laticauda* subsp. nov., female, end of abdomen, ventral view.
12. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, male, end of abdomen, posterior view.
13. *Gryllacris pictipes* sp. nov., male, end of abdomen. The bristle hairs of cerci, styles, and subgenital plate are not figured.

PLATE 5

FIG. 1. *Gryllacris melanosticta* sp. nov., tegmen.
2. *Gryllacris melanosticta* sp. nov., tegmen.
3. *Gryllacris samarita* sp. nov., tegmen.

PLATE 6

FIG. 1. *Gryllacris fuscinervis panayensis* var. nov., male, tegmen.
2. *Gryllacris fuscinervis panayensis* var. nov., female, tegmen.
3. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, male, tegmen.
4. *Gryllacris nigrogeniculata* Brunner v. Wattenwyl, female, tegmen.

PLATE 7

FIG. 1. *Gryllacris nigrogeniculata tristis* subsp. nov., tegmen.
2. *Gryllacris nigrogeniculata tristis* subsp., nov., tegmen.
3. *Gryllacris brachyptera brevisector* subsp. nov., tegmen.
4. *Gryllacris brachyptera brevisector* subsp. nov., tegmen.

PLATE 8

FIG. 1. *Gryllacris brachyptera* Gerstäcker, tegmen.
2. *Gryllacris brachyptera* Gerstäcker, tegmen.
3. *Gryllacris brachyptera* Gerstäcker, fore part of hind wing.
4. *Gryllacris maculipennis specularis* subsp. nov., tegmen.

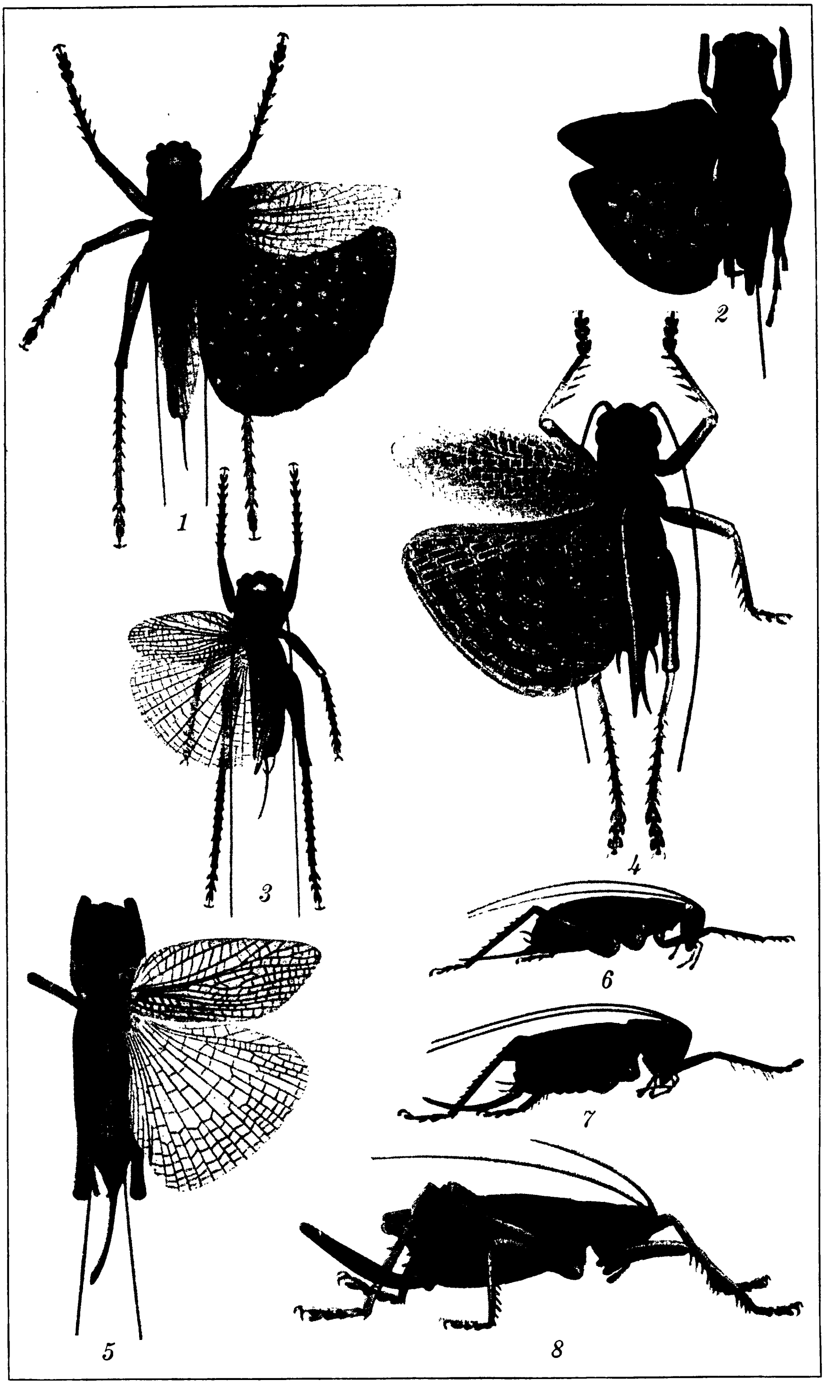
PLATE 9

FIG. 1. *Gryllacris plebeia* (typica) Stål, male, tegmen.
2. *Gryllacris plebeia* (typica) Stål, male, tegmen.
3. *Gryllacris plebeia connexa* subsp. nov., male, tegmen.
4. *Gryllacris plebeia connexa* subsp. nov., male, tegmen.

PLATE 10

FIG. 1. *Gryllacris plebeia* subsp. *immaculata* Griffini, tegmen of a male from Los Baños.

2. *Gryllacris plebeia* subsp. *immaculata* Griffini, tegmen of a female from Mount Maquiling.
3. *Gryllacris plebeia* subsp. *immaculata* Griffini, tegmen of a female from Polillo Island.
4. *Gryllacris pustulata ocellaris* subsp. nov., female, clypeus and labrum.
5. *Gryllacris nigrilabris* Gerstäcker, female, clypeus and labrum.
6. *Gryllacris obscura* ? Brunner v. Wattenwyl, male, clypeus and labrum. Specimen from Tambang Sawah (Benkulen), recorded in Treubia 5 Livr. 1–3 (1924) 233.
7. *Gryllacris obscura javanica* Griffini, male, clypeus and labrum.



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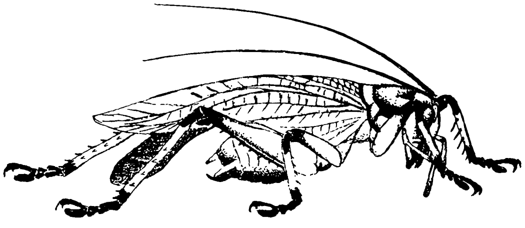

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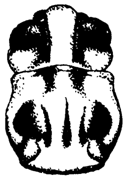

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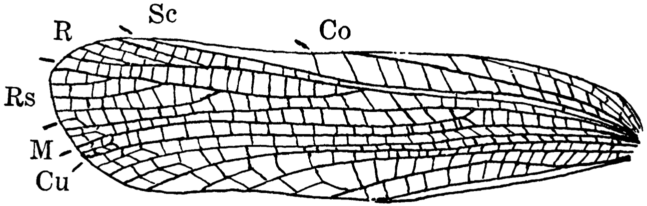

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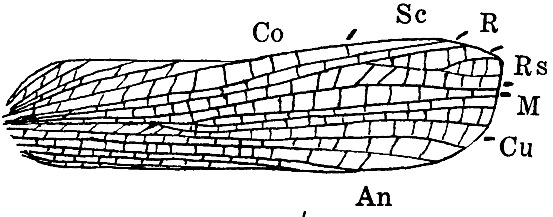

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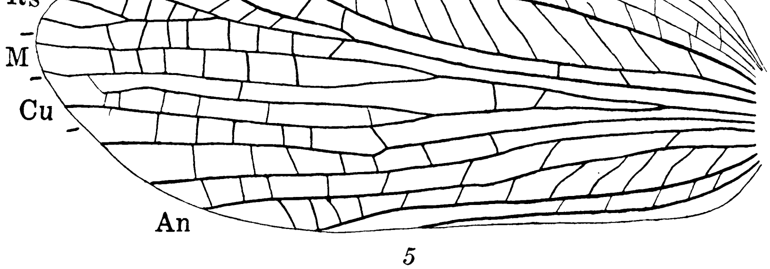

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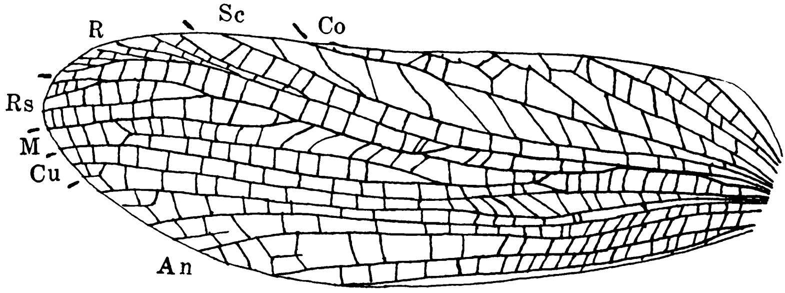

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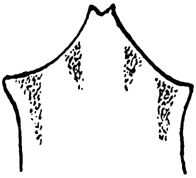

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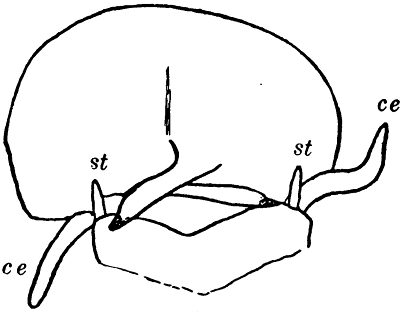

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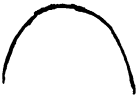

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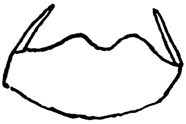

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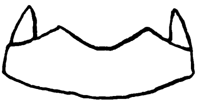

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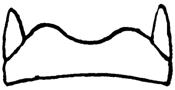

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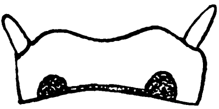

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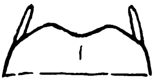

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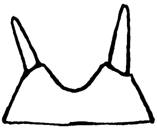

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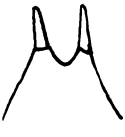

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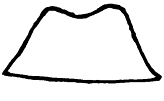

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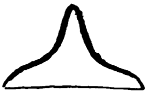

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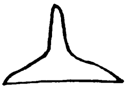

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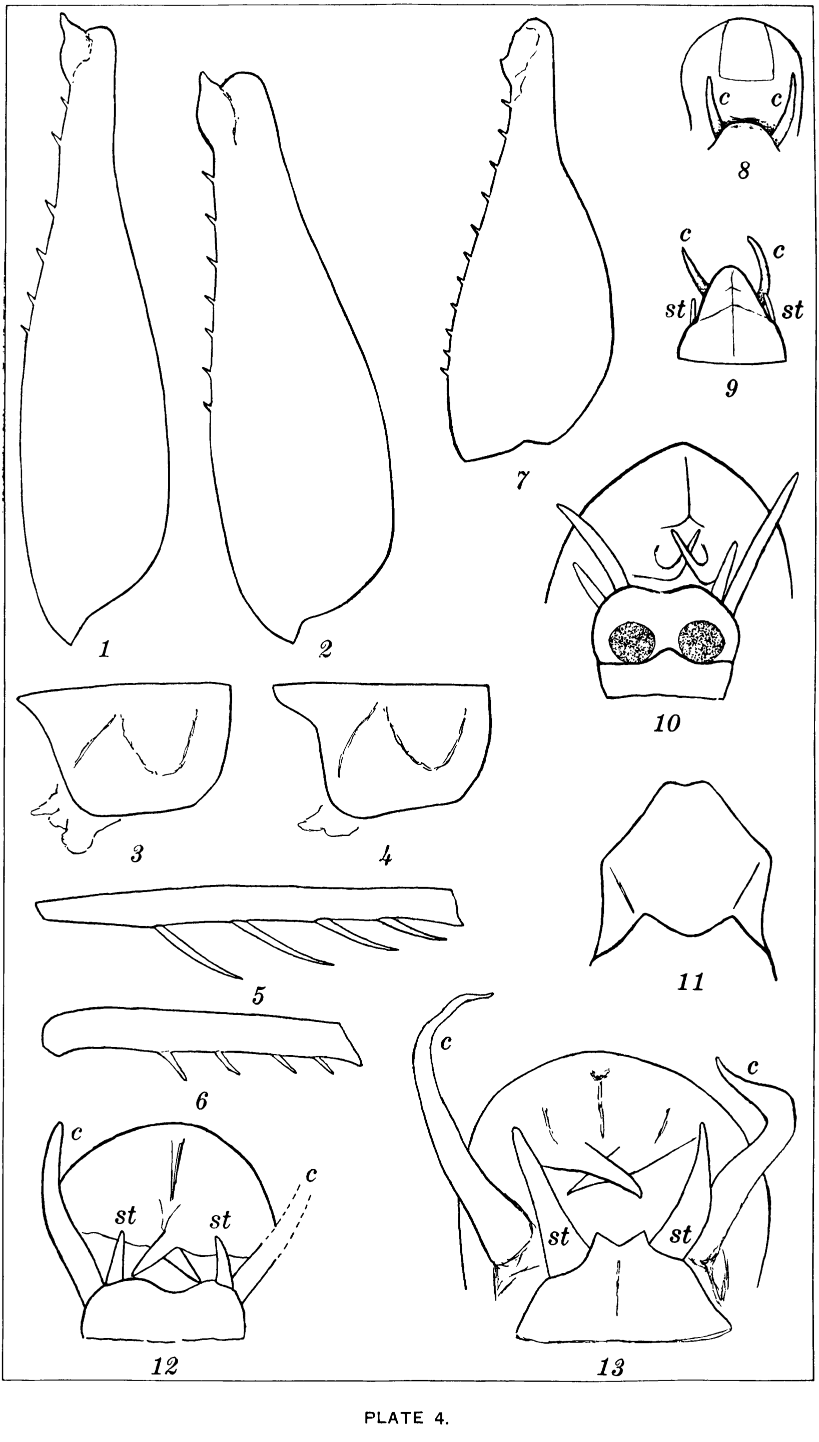

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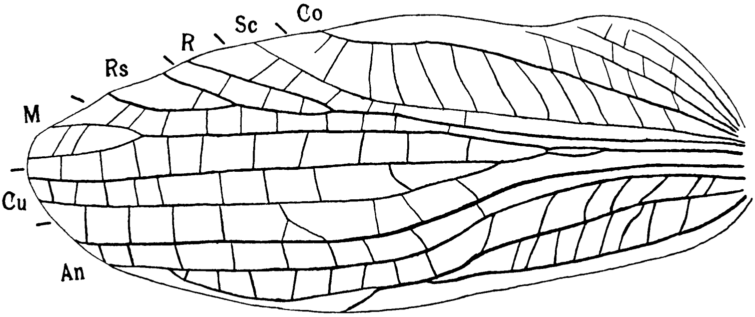

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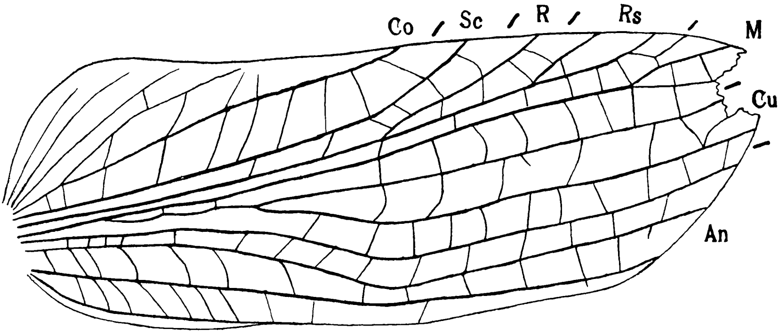

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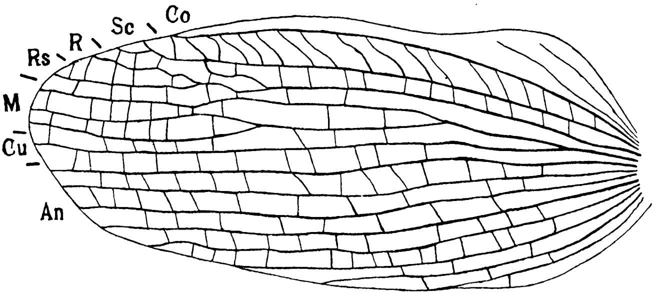

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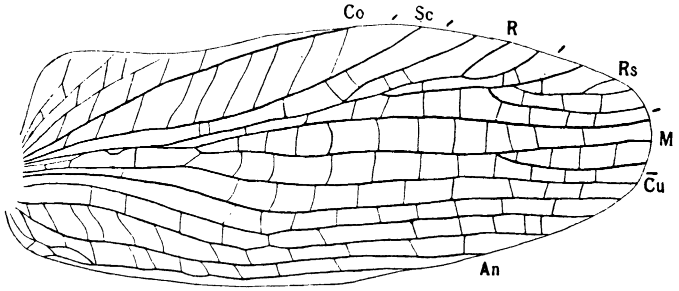

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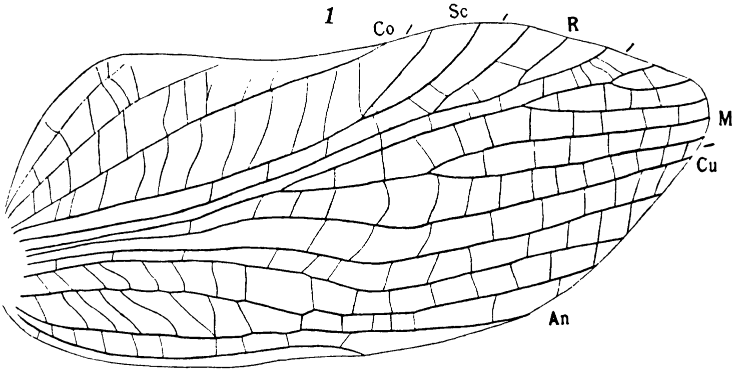

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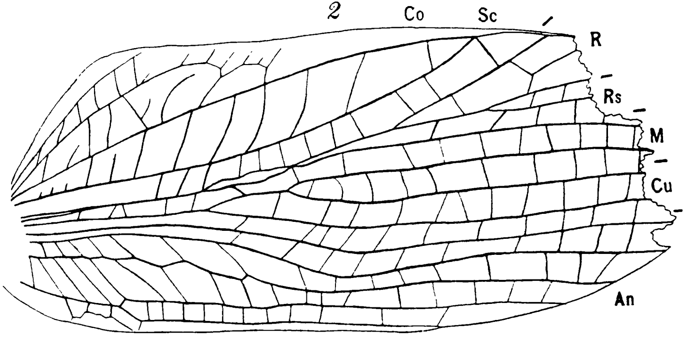

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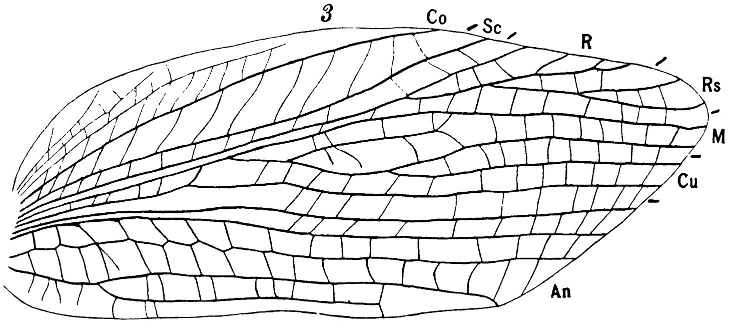

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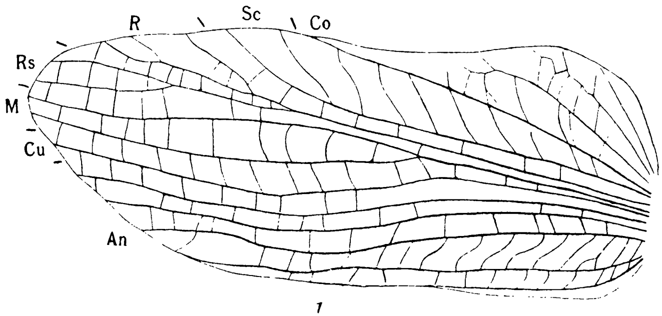

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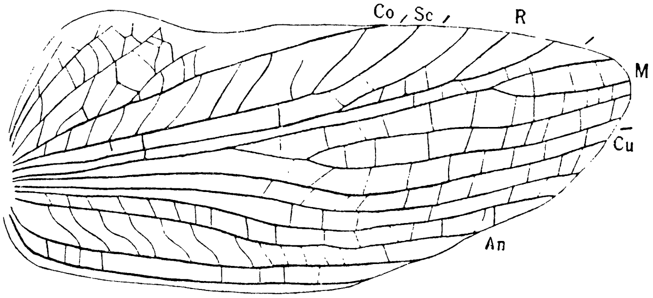

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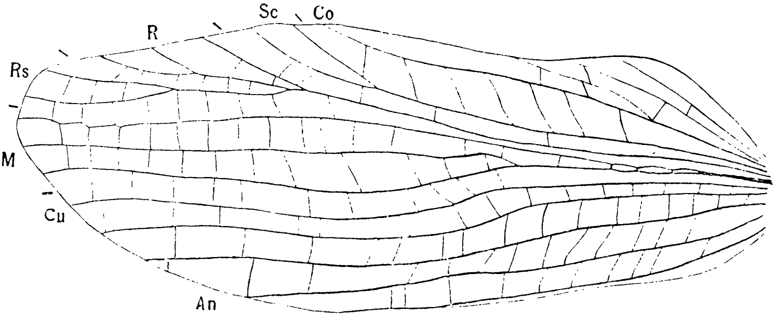

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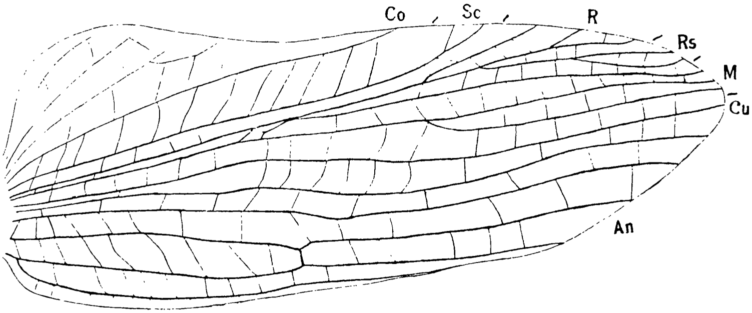

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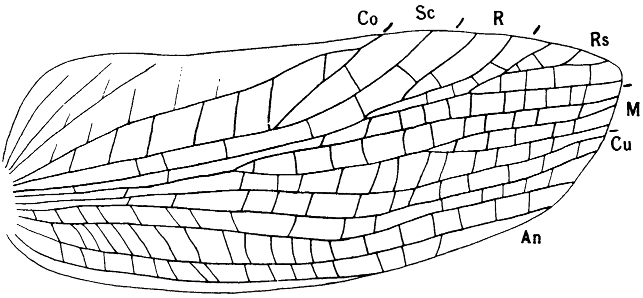

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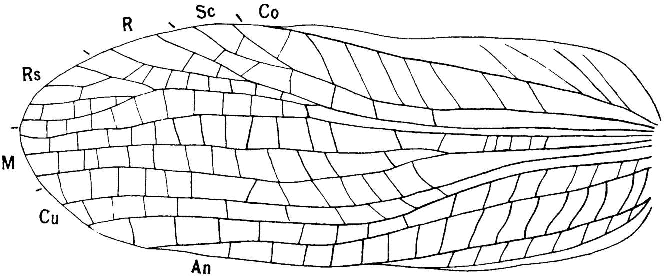

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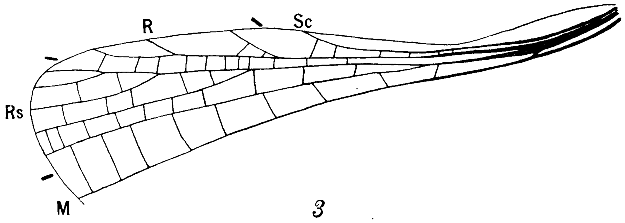

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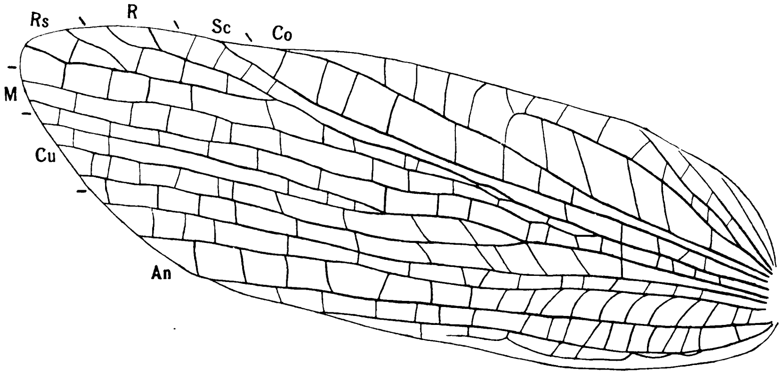

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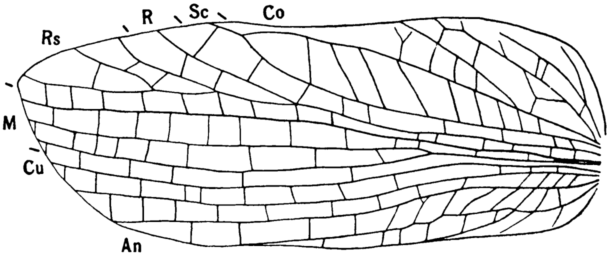

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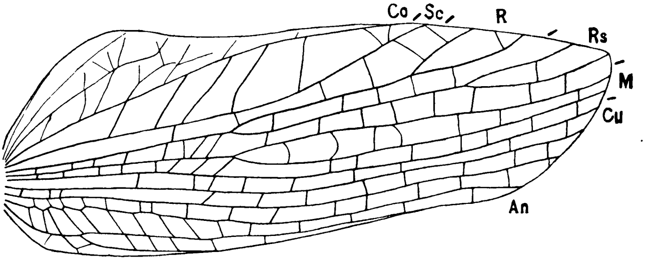

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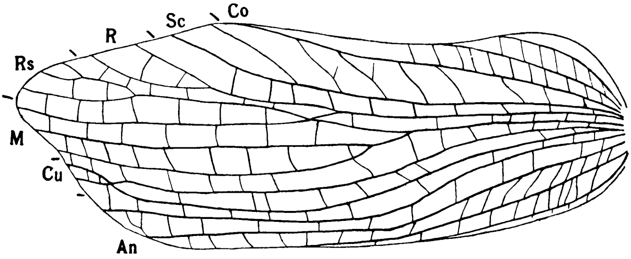

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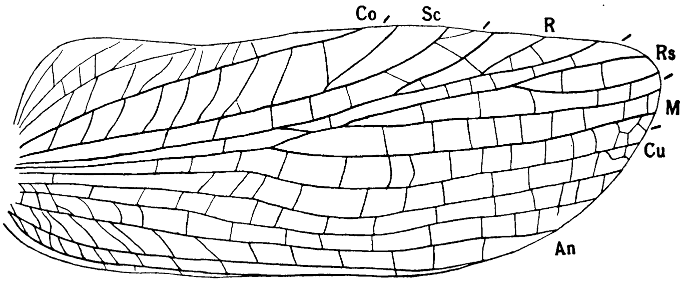

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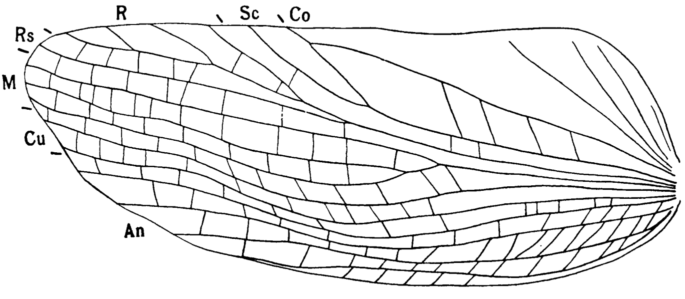

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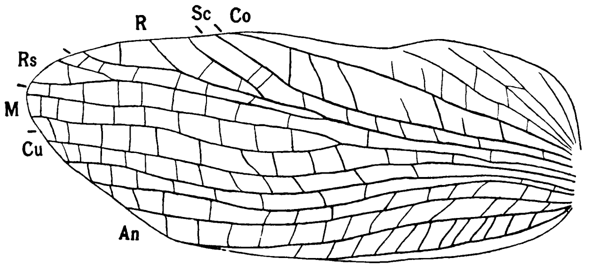

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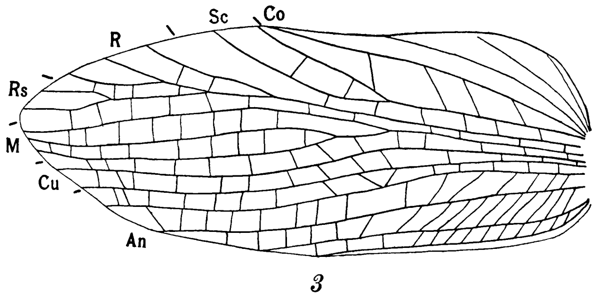

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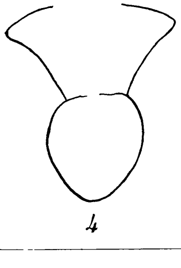

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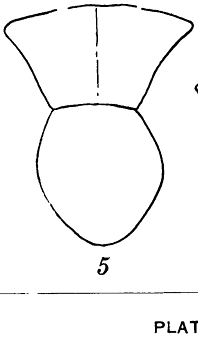

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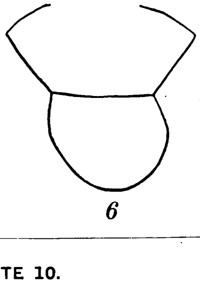

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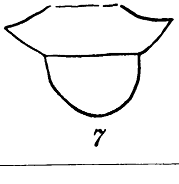

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VOL. 28, NO. 2 OCTOBER, 1925

THE PHILIPPINE JOURNAL OF SCIENCE

BUREAU OF SCIENCE
MANILA

MANILA
BUREAU OF PRINTING
1925

212100

THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science of the Government of the Philippine Islands

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The Journal is issued twelve times a year. The subscription price is 5 dollars, United States currency, per year. Single numbers, 50 cents each.

Subscriptions may be sent to the Business Manager, Philippine Journal of Science, Bureau of Science, Manila, P. I., or to any of the agents listed on the third page of this cover.

THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 28 OCTOBER, 1925 No. 2

CONTRIBUTION TO THE QUESTION OF DYSENTERY CARRIERS IN THE PHILIPPINE ISLANDS

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Of the Biological Laboratory, Bureau of Science, Manila

In Manila dysenteric infections have often occurred in the household. In that respect bacillary dysentery resembles typhoid fever epidemiologically. Several members of the same family or household are known to have been taken sick with bacillary dysentery, either simultaneously or successively, until gradually the entire family contracted the disease. Such occurrences clearly indicate that the condition known as dysentery carriers exists in Manila and that the sporadic cases throughout the year and the seasonal outbreaks in the Philippine Islands are due to carriers. Thanks probably to improved technic(12) and the care taken to obtain stool specimens in as fresh a condition as possible, we are able to report a study of several cases of dysentery carriers, which has not been done heretofore.

It has been proved that there are typhoid and cholera carriers in the Philippines;(1) the greatest amount of research has been done in connection with cholera vibrio carriers.(13) However, there is lack of laboratory evidence regarding carriers of *Bacillus dysenteriæ*.

The available literature on *Bacillus dysenteriæ* carriers revealed certain data and facts that bear on our present investigation.

Verzár and Weszeczky(18) found 13 per cent of dysentery carriers among 400 examinations. These were convalescents and were afebrile. They also found, during a small epidemic, two chronic carriers, who were the cause of the outbreak, because the members of their household also became infected; and they further found that the intermittent character of dysentery carriers is very pronounced.

Hudson(8) gives the following summary of his study:

> In the case of dysentery here reported, the symptoms of violent diarrhœa and weakness occurred intermittently for about three and a half years after the onset (June, 1918). A strain of *B. dysenteriæ*, Flexner type, was isolated during the latest acute attack (January, 1922). This organism was not found subsequently in a period during which symptoms were absent, even after the use of a laxative. Possibly a relation exists between the organism isolated and the appearance of "clay stools" in 1919; and it may be reasonably conjectured that there was an infection of the gall bladder or of the bile duct at that time, with temporary obstruction.
>
> Specific agglutinins for the Flexner type of dysentery bacillus were found in the blood of the patient, but none for the Shiga type. This agglutination test was made about one hundred forty-five days after the last appearance of symptoms and the successful bacteriologic examination of the fæces. The persistence of agglutinins for at least one hundred forty-five days and the absence of continuous positive cultural findings indicate the value of the agglutination test in the detection of carriers or of persistent chronic cases of the Flexner type of dysentery. The recovery of the pathogen only at the time of the appearance of symptoms points, not only to the chronicity of the infection, but also to the possibility of an alteration in the resistance of the host.

McLeod and Ritchie(11) state:

> In a general way, therefore, we have gathered the impression that freshly prepared emulsions of dysentery bacilli are more specific than those which have stood for a considerable period, i. e., they react well with the sera of infected people, and very little with those of normal individuals. We believe that by controlling from time to time the sugar reactions of a strain and its agglutination, and emulsifying a well-grown agar slope after 18 hours' incubation, always in the same amount of saline, one will probably arrive as near to a standard in connection with agglutination of emulsions of dysentery bacilli as by a more elaborate method.

Speares and Debono(17) draw the following conclusions:

> 1. In an ordinary attack of Shiga a positive agglutination may be expected about the tenth day, and further tests should be made at the end of the second, and if necessary at the end of the third week in case there is a gradual rise in titer.
>
> 2. In Flexner cases a serological diagnosis is not always possible. Frequently the attack lasts only a few days and from the cases we have seen we consider that infection by the Flexner organism does not give rise to as severe an attack of dysentery as Shiga or Y. We may mention that we have not had a death due to infection by this organism.

3. An infection by Shiga raises the titer for the Flexner-Y type, etc.

4. We have not found that the giving of curative sera has any effect on the specific agglutination titer; the titer of the curative sera (lister) used at Tigne was 1 in 320 to Shiga.

5. Failure to obtain agglutination when the disease is clinically of a mild type makes it probable that the infecting organism is of the Flexner or Y type. This probability becomes almost a certainty if the clinical picture and the character of the stools (presence of pus, absence of pathogenic protozoa) point to the case being one of bacillary dysentery.

Cunningham (3) states:

1. A latent form of dysentery exists, which may, when examined, show the presence of varying quantities of mucus or mucus and blood in the stools, and ulcers in the rectum, and may also be secreting dysentery bacilli. Such cases may be compatible with apparent health and are therefore liable to pass undetected.

4. A series of ten successive examinations is sufficient to detect all the cases of latent dysentery present in a population.

Fletcher and Mackinnon (6) review their work as follows:

1. During the 12 months ending May 31, 1918, 935 dysentery convalescents and 847 patients who were convalescent from other diseases, such as enteric and trench fever, were examined in this laboratory.

2. Of 229 dysentery convalescents whose histories were taken—
   29 had had 2 or 3 isolated attacks.
   88 were "chronic" cases.

3. 61 were carriers of *B. dysenteriæ* (Flexner).
   13 were carriers of *B. dysenteriæ* (Shiga).

5. Most of the 88 chronic cases had suffered from recurrent attacks of dysentery over long periods.

7. In the group of 935 dysentery convalescents, 71, or 6.95 per cent, were found to be carriers of dysentery bacilli; 26, or 2.78 per cent, were persistent carriers.

Fifty-eight were Flexner carriers (5.56 per cent) and 13 were Shiga carriers (1.39 per cent).

8. In the group of 847 non-dysentery convalescents there were 9 carriers of dysentery bacilli (1.06 per cent) and 6 of these gave a history of dysentery. These 9 were all Flexner carriers.

9. The 13 Shiga carriers were all persistent carriers.

10. Thirteen out of 61 Flexner carriers were persistent carriers.

11. All the Shiga carriers suffered from chronic dysentery and mental depression, and were unfit for work.

12. With two exceptions the carriers of Flexner's bacillus were in fair health and fit for work, under favorable conditions.

15. The infecting organism is more constantly present in the fæces of Shiga carriers than in carriers of *B. dysenteriæ*, Flexner.

16. One of the chief characters of persistent infections with Flexner's bacillus is intermission.

Dysentery bacilli are quickly overgrown, where there is delay in the examination of the specimens.

Martin, Kellaway, and Williams (10) found twelve organisms isolated culturally and biochemically, which resembled the Flexner group of bacilli but failed to agglutinate with any Y or Flexner serum at their disposal. Eight of the strains were retested with the same serum six months later, when five of them agglutinated fairly well.

Fletcher (5) reports a case whose "excreta have been examined sixty-one times since March 22, 1917, and *B. dysenteriæ* (Shiga) has been isolated on thirty-five occasions; he is now in the seventeenth week and is still a carrier."

Martin and Williams, (9) examining stools of dysentery patients for bacilli during the course of the disease found:

First week, 70 per cent successful recoveries.
Second week, 53 per cent successful recoveries.
Third week, 18 per cent successful recoveries.
Fourth week and later, nil.

They say:

> Our chance of recovering dysentery bacilli rapidly diminished after the first few days. This appeared to be the case whether the stools remained characteristically dysenteric or not.
>
> The muco-pus and epithelial débris discharged in the milder pathological condition, and the necrosed coagulated superficial layers of the mucous membrane in the more serious is, except in the earliest stages of the disease, invaded by hosts of intestinal organisms, which soon overwhelm the dysentery bacilli originally present. This places a serious limit on the value of a bacteriological diagnosis of dysentery. If reliance had been placed on the results of one examination but 15 per cent would have been discovered.

Fletcher (4) says:

> There was not a single instance, during the examination of 1,000 convalescents, of the isolation of dysentery organisms by the Brillians-Greem method, but by direct plating of the fæces on to Endo's medium dysentery bacilli, of the mannite-fermenting group, were isolated from eighteen patients and *B. dysenteriæ* (Shiga) from one.

The present investigation was made in connection with the routine examination of stools for typhoid and dysentery for the Philippine Health Service. (7) The method of examination employed in all cases was as follows: A portion of the stool was emulsified in acid (+ phenolphthalein) bouillon and incubated for from two to six hours at 37° C. From this transplants were made on lactose eosin-methylene blue agar plates. The plates were incubated at 37° C. for twenty-four hours and then examined. Suspicious colonies were picked out and inoculated into Russell's double sugar medium, and the tubes incubated at 37° C. for twenty-four hours. The result of the growth on Russell's medium decided whether or not the cultures should be further transplanted into different sugars, litmus milk, acid bouillon (with a strip of lead acetate paper hanging from the mouth of the tube), and acid agar slants. Macroscopic agglutination was made with polyvalent dysenteric immune serum by emulsifying a portion of the suspicious culture in a 1:100 or 1:200 dilution of the immune serum and then incubating at 37° C. for twenty-four hours. Hanging drops were used for examination as to motility. Gram's stain was applied in every case.

The number of examinations for dysentery carriers from January 1 to December 31, 1924, amounted to 3,328. In the carrier series there was a large group, 2,860, consisting of specimens collected at random and sent to the Bureau of Science by the Philippine Health Service, and a small group, 468, consisting of specimens collected at the Bureau of Science directly from food handlers reporting to the Bureau of Science (by order of the Philippine Health Service). The last-mentioned group comprised specimens passed at the laboratory and examined immediately. It is evident that in these cases the specimen obtained was as fresh as possible for immediate examination. In the large group, 2,860, 7 (0.24 per cent) carriers were detected: 1 Flexner carrier (F. F., studied in this investigation) and 3 Shiga carriers (D. S., J. I., and M. S., studied in this investigation), and 2 Shiga carriers and 1 Flexner carrier, which were not available for further study. In the small group, 468, 7 (1.49 per cent) other carriers were detected; 1 Flexner and Shiga carrier (F. P., reported in this investigation), 3 Flexner carriers (T. N., J. B., and D. G., also reported in this investigation), 2 Shiga carriers (A. E. and J. M., reported in this investigation), and another Flexner carrier whom, so far, we have not been able to locate. That the technic used for isolating the dysentery organism was satisfactory is shown by the relatively high percentage (1.49 against 0.25 per cent) of positives in the small group, and also by the fact that many repeaters were found among the carriers studied, where the specimens were obtained in a fresh condition, just as soon as passed.

Of the carriers discovered, 10 were accessible and were made the object of study. Their histories are as follows:

Carrier 1, April 3, 1924.—F. F., 27 years of age, male, Filipino, native of Hagonoy, Bulacan Province, residing in Manila since 1920, and living at 1712 Tioko, Tondo, water carrier by occupation. At 7 years of age he suffered from mucous and bloody diarrhœa with tenesmus for two months, from which he recovered without any treatment, as far as he knows. He denies having suffered from diarrhœa or constipation since then. As far as he can tell, none of the people with whom he has lived have suffered from dysentery. He is a Flexner carrier.

Carrier 2, May 1, 1924.—F. P., 21 years of age, male, Filipino, native of Cardona, Rizal Province, and residing there, a student by occupation. He came to Manila on April 28, 1924, to apply for permission to enter the United States. About five years ago he suffered from fever and profuse diarrhœa, not mucoid or bloody, from which he recovered without any treatment. Last year he lived in San Pablo, Laguna Province; in the household a man was suffering from mucous and bloody diarrhœa. Shortly after the man recovered, he (P.) had an attack of fever with abdominal pain and profuse and watery diarrhœa, which lasted one day. Since then up to the present time he has not suffered from diarrhœa. Sometimes he has had abdominal pain. Stool regular. His stools, he says, are often hard and scanty and covered with mucus. He is a Flexner and Shiga carrier.

Carrier 3, May 12, 1924.—T. N., 28 years old, male, Filipino, a native of Agno, Pangasinan Province, residing in Manila since 1922, and employed by the Bureau of Agriculture. When a student in Los Baños, Laguna Province, he had diarrhœa for four or five days, with abdominal pain and tenesmus, in which he passed plenty of mucus, but no blood and, as far as he knows, he had no fever during this attack. He denies having suffered from constipation or diarrhœa since then. He is a Flexner carrier.

Carrier 4, July 11, 1924.—A. E., 51 years old, female, Filipino, residing at Parañaque, Rizal Province, food handler. At 15 or 16 years of age she suffered from mucous and bloody diarrhœa from which she soon recovered. Denies having suffered from diarrhœa or constipation since then. Bowels move regularly. She is apparently in good health. This woman is a Shiga carrier.

Carrier 5, July 10, 1924.—J. B., 35 years old, male, Filipino, residing at 141 Arquiza, Ermita, Manila, food handler. Denies ever having suffered from bloody diarrhœa. Bowels regular. He says he never has abdominal pain or diarrhœa. He is a Flexner carrier.

Carrier 6, July 10, 1924.—D. S., 42 years old, male, Filipino, residing at 211 Lardizabal, Sampaloc, Manila, food handler.

He is a strong, healthy-looking man who denies ever having suffered from bloody diarrhœa. He says that sometimes he has diarrhœa and abdominal pain. Otherwise bowels are regular. Stools have no mucus, as far as he can tell. This man is a Shiga carrier.

Carrier 7, July 21, 1924.—D. G., 31 years old, male, Filipino, residing at 243 Cabildo, Manila, food handler (ice-cream peddler.) He is a healthy-looking man who denies ever having been sick with bloody diarrhœa. Bowels are regular. This man is a Flexner carrier.

Carrier 8, August 1, 1924.—M. S., 25 years old, male, Japanese, food handler, residing at 101 Gastambide, Sampaloc. Says he has had malaria. Last April (four months ago) he suffered from diarrhœa, without fever, without blood or mucus, for a few days. During this time he was not confined to bed at all, for he did not feel ill. He took some Japanese medicine and recovered. He is a Shiga carrier.

Carrier 9, August 1, 1924.—J. M., 40 years old, female, Filipino, food handler, residing at Parañaque, Rizal Province. She denies ever having suffered from diarrhœa. She looks healthy. She is a Shiga carrier.

Carrier 10, September 1, 1924.—J. I., 32 years old, male, Filipino, residing at 1000 Int. Anak n͠g Bayan, Paco, Manila. Gives a history of having had four attacks of bloody diarrhœa with fever since 1909 up to this time. The last attack occurred about one month ago. He says that he often suffers from abdominal pain. He is a stout, healthy-looking individual. This man is a Shiga carrier.

Carrier 1 was examined eleven consecutive times. Table 1 gives the results of these examinations.

Carrier 2 was examined five times. The first time he was examined, the organism was of the Flexner type. The second time a Shiga type bacillus was isolated. The next two times the Flexner type was again recovered. The last examination was negative. Table 1 shows the results of these examinations.

Carrier 3 was examined eleven times. All of the examinations showed him to be a Flexner type carrier. Table 1 gives the results of these examinations.

Carrier 4 was examined six times; carrier 5 was examined six times; carrier 6 was examined four times; carrier 7 was examined three times; carrier 8 was examined four times; carrier 9 was examined four times; carrier 10 was examined six times. The results of all of these examinations are shown in Table 1.

TABLE 1.—*Showing the results of the cultural study of carriers 1 to 10.*

CARRIER 1.

Date of examination.	*B. dysenteriæ.*	Carbohydrate reactions.					Litmus milk.	Lead acetate.	Agglutination.	Motility.	Gram stain.	Indol test.	Remarks.
		Lactose.	Glucose.	Maltose.	Mannite.	Saccharose.							
1924													
April 4	+	—	+	+	+	—	+	—	+	—	—	—	
April 11													
April 28	+	—	+	+	+	—	+	—	+	—	—	—	
May 3	—												Patient states he is taking a medicine which a certain pharmacist has given to him.
May 6	—												Do.
May 9	—												Do.
May 13	—												Do.
May 15	—												Do.
May 17	—												Do.
May 18	—												Do.
May 29	—												Do.
June 2	—												Do.

CARRIER 2.

1924													
May 1	+	—	+	+	+	—	+	—	+	—	—	+	
May 6	+	—	+	+	—	—	+	—	+	—	—	+	
May 8	+	—	+	+	+	—	+	—	+	—	—	+	
May 13	+	—	+	+	+	—	+	—	+	—	—	+	
May 15	—	—											

CARRIER 3.

1924													
May 12	+	—	+	+	+	—	+	—	+	—	—	+	
May 17	—												
May 19	+	—	+	+	+	—	+	—	+	—	—	+	
May 21	+	—	+	+	+	—	+	—	+	—	—	+	
May 22	—												
May 23	+	—	+	+	+	—	+	—	+	—	—	+	
June 1	+	—	+	+	+	—	+	—	+	—	—	+	
June 2	—												
June 7	+	—	+	+	+	—	+	—	+	—	—	+	
June 13	—												
June 14	—												

CARRIER 4

1924													
July 11	+	—	+	+	—	—	+	—	+	—	—	+	
July 17	+	—	+	+	—	—	+	—	+	—	—	+	
July 21	+	—	+	+	—	—	+	—	+	—	—	+	
July 26	—												She has taken medicine.
July 30	—												
August 1	—												

TABLE 1.—*Showing the results of the cultural study of carriers 1 to 10*—Continued.

Date of examination.	*B. dysenteriæ.*	Carbohydrate reactions.					Litmus milk.	Lead acetate.	Agglutination.	Motility.	Gram stain.	Indol test.	Remarks.
		Lactose.	Glucose.	Maltose.	Mannite.	Saccharose.							
CARRIER 5.													
1924													
July 11	+	—	+	+	+	—	+	—	+	—	—	—	
July 22	—												
July 25	+	—	+	+	+	—	+	—	+	—	—	—	
July 28	—												
August 1	—												
August 4	—												
CARRIER 6.													
1924													
July 10	+	—	+	+	—	—	+	—	+	—	—	+	
July 23	—												Swab only was obtained.
July 29	—												Delayed specimens.
August 5	+	—	+	+	—	—	+	—	+	—	—	+	Came to laboratory and passed a stool while there.
CARRIER 7.													
1924													
July 21	+	—	+	+	+	—	+	—	+	—	—	—	
July 25	+	—	+	+	+	—	+	—	+	—	—	—	
July 28	+	—	+	+	+	—	+	—	+	—	—	—	

CARRIER 8.

1924												
August 1	+	—	+	+	—	—	+	—	+	—	—	+
August 12	—											
August 15	—											
August 19	—											

CARRIER 9.

1924												
August 1	+	—	+	+	—	—	+	—	+	—	—	+
August 8	—											
August 18	—											
August 27	—											

CARRIER 10.

1924												
September 1	+	—	+	+	—	—	+	—	+	—	—	+
September 8	+	—	+	+	—	—	+	—	+	—	—	+
September 12	+	—	+	+	—	—	+	—	+	—	—	+
September 18	+	—	+	+	—	—	+	—	+	—	—	+
September 19	—											
September 25	—											

Blood was obtained from each of these carriers to test the agglutinative power of their sera against their respective dysentery strains and against known dysentery strains kept in stock. The blood was withdrawn from a vein in the arm, and allowed to stand until the serum separated from the clot. Then with a sterile pipette the serum was pipetted off and a portion was inactivated by heating at 56° C. for half an hour. Dilutions were then made of the active and inactivated sera 1: 5, 1: 10, 1: 20, 1: 40, 1: 80, and 1: 160. Agglutination tubes were set up in series of six, each series containing the various dilutions. In these dilutions the corresponding strain of dysentery was emulsified, using for this purpose a twenty-four-hour culture on acid agar. Enough of the culture was emulsified in each dilution to render the liquid distinctly opalescent. The tubes were incubated at 37° C. for twenty-four hours, and at the end of this time the readings were made. The results of these tests are shown in Tables 2 to 11; in these tables, as well as in Table 12, the following symbols are used:

+ + + = complete or almost complete agglutination.
+ + = partial agglutination.
+ = trace of agglutination.
— = no agglutination.

TABLE 2.—*Showing agglutination reactions of the blood serum of carrier 1.*

Serum.	Dilution.	Flexner carrier 1.	Flexner "known."
Active	1 : 5	+++	+
Do	1 : 10	+++	+
Do	1 : 20	++	+
Do	1 : 40	++	++
Do	1 : 80	+	+
Do	1 : 160	—	+
Do	[a]	—	—
Inactivated	1 : 5	+++	+++
Do	1 : 10	+++	+++
Do	1 : 20	++	+++
Do	1 : 40	++	++
Do	1 : 80	+	++
Do	1 : 160	—	+
Do	[a]	—	—

[a] Control.

TABLE 3.—*Showing agglutination reactions of the blood serum of carrier 2.*

Serum.	Dilution.	Flexner carrier 2.	Flexner "known."	Shiga "known."	Shiga carrier 2.
Active	1 : 5	—	—		
Do	1 : 10	—	—		
Do	1 : 20	—	—		
Do	1 : 40	+	—		
Do	1 : 80	++	—		
Do	1 : 160	++	—		
Do	([a])	—	—		
Inactivated	1 : 5	+++	+++	+++	+
Do	1 : 10	+++	+++	+++	+
Do	1 : 20	++	+	+++	—
Do	1 : 40	+	—	+++	—
Do	1 : 80	+	—	+++	—
Do	1 : 160	—	—	+++	—
Do	([a])	—	—	—	—

[a] Control.

TABLE 4.—*Showing agglutination reactions of the blood serum of carrier 3.*

Serum.	Dilution.	Flexner carrier 3.	Flexner "known."
Active	1 : 5	+	+++
Do	1 : 10	+	+++
Do	1 : 20	—	+++
Do	1 : 40	—	+++
Do	1 : 80	—	++
Do	1 : 160	—	—
Do	([a])	—	—
Inactivated	1 : 5	+	+++
Do	1 : 10	+	+++
Do	1 : 20	—	+++
Do	1 : 40	—	++
Do	1 : 80	—	—
Do	1 : 160	—	—
Do	([a])		

[a] Control.

TABLE 5.—*Showing agglutination reactions of the blood serum of carrier 4.*

Serum.	Dilution.	Shiga carrier 4.	Shiga "known."	Flexner "known."
Inactivated	1 : 5	—	+++	+++
Do.	1 : 10	++	+++	+++
Do.	1 : 20	+	+++	++
Do.	1 : 40	+	+++	+
Do.	1 : 80	—	+++	—
Do.	1 : 160	—	+++	—
Do.	([a])	—	—	—

[a] Control.

TABLE 6.—*Showing agglutination reactions of the blood serum of carrier 5.*

Serum.	Dilution.	Flexner carrier 5.	Flexner "known."	Shiga "known."
Inactivated	1 : 5	+++	+++	+++
Do	1 : 10	+++	+++	+++
Do	1 : 20	+++	+++	+++
Do	1 : 40	+++	+++	+++
Do	1 : 80	+++	++	+++
Do	1 : 160	+++	+	+++
Do	([a])	—	—	—

[a] Control.

TABLE 7.—*Showing agglutination reactions of the blood serum of carrier 6.*

Serum.	Dilution.	Shiga carrier 6.	Shiga "known."	Flexner "known."
Inactivated	1 : 5	+++	+++	+++
Do	1 : 10	+++	+++	+++
Do	1 : 20	+++	+++	++
Do	1 : 40	+++	+++	++
Do	1 : 80	++	+++	—
Do	1 : 160	—	+++	—
Do	([a])	—	—	—

[a] Control.

TABLE 8.—*Showing agglutination reactions of the blood serum of carrier 7.*

Serum.	Dilution.	Flexner carrier 7.	Flexner "known."	Shiga "known."
Inactivated	1 : 5	+++	+++	+++
Do	1 : 10	+++	+++	+++
Do	1 : 20	++	++	+++
Do	1 : 40	++	++	++
Do	1 : 80	+	+	++
Do	1 : 160	—	—	+
Do	([a])	—	—	—

[a] Control.

TABLE 9.—*Showing agglutination reactions of the blood serum of carrier 8.*

Serum.	Dilution.	Shiga carrier 8.	Shiga "known."	Flexner "known."
Inactivated	1 : 5	+++	+++	+++
Do	1 : 10	+++	+++	+++
Do	1 : 20	+++	+++	+++
Do	1 : 40	+++	+++	+++
Do	1 : 80	+++	+++	—
Do	1 : 160	+++	+++	—
Do	([a])	—	—	—

[a] Control.

TABLE 10.—*Showing agglutination reactions of the blood serum of carrier 9.*

Serum.	Dilution.	Shiga carrier 9.	Shiga "known."	Flexner "known."
Inactivated	1 : 5	++	+++	+++
Do	1 : 10	++	+++	+++
Do	1 : 20	++	+++	+++
Do	1 : 40	++	+++	+++
Do	1 : 80	++	+++	++
Do	1 : 160	—	+++	—
Do	(a)	—	—	—

[a] Control.

TABLE 11. *Showing agglutination reactions of the blood serum of carrier 10.*

Serum.	Dilution.	Shiga carrier 10.	Shiga "known."	Flexner "known."
Inactivated	1 : 2	+++	+++	+++
Do	1 : 4	++	+++	+++
Do	1 : 8	+	+++	+++
Do	1 : 16	+	+++	+++
Do	1 : 32	+	+++	++
Do	1 : 64	—	+++	—
Do	(a)	—	—	—

[a] Control.

Table 3 shows that the serum of the Flexner and Shiga carrier (carrier 2) agglutinated the Shiga strain isolated from his stool only in 1: 5 and 1: 10 dilutions, whereas it agglutinated a known Shiga strain in as high a dilution as 1:160. In order to obtain further evidence that the Shiga strain isolated from the stool of this carrier was a real Shiga type strain of *B. dysenteriæ,* a rabbit was immunized with this strain in order to carry out cross agglutination. This work on the rabbit was started on May 21, 1924, on 0.1 of a loopful, and by August 23, 1924, it received three slants in one dose. For this purpose twenty-four-hour-old cultures on acid agar were used. The growth was emulsified in salt solution and heated for half an hour at 60° C. The corresponding dose was then injected subcutaneously, in the abdomen, every five days. Sixteen days after the last injection blood was obtained from the ear vein of this rabbit, to test the agglutination power of its serum. The serum was separated from the clot and inactivated at 56° C. for half an hour. The following dilutions of this serum were made: 1: 2, 1: 4, 1: 8, 1: 16, 1: 32, 1: 64, 1: 128, 1: 256, and 1: 512, and four series arranged, 9 small, sterile test tubes in each series. Into each series the different dilutions were distributed, using 0.5 cubic centimeter for each test tube. In the first series the Shiga strain isolated from the stool of carrier 2, and against which this rabbit was immunized, was used. In the second series a known Shiga strain was used. In the third series a known Flexner strain was used. In the fourth series the Flexner strain isolated from the stool of the same carrier (carrier 2) was used. All the cultures used were twenty-four hours old, grown on acid agar slants. The results of these tests are shown in Table 12.

TABLE 12.—*Showing agglutination power of immune serum prepared from carrier 2, Shiga strain.*

Serum.	Dilution.	Shiga carrier 2.	Shiga "known."	Flexner "known."	Flexner carrier 2.
Carrier 2, Shiga immune	1 : 2	+++	+++	+++	+++
Do	1 : 4	+++	+++	+++	+++
Do	1 : 8	+++	+++	+++	+++
Do	1 : 16	++	+++	+++	+++
Do	1 : 32	++	+++	++	+++
Do	1 : 64	++	+++	++	+++
Do	1 : 128	++	++	++	+++
Do	1 : 256	++	++	+	+++
Do	1 : 512	++	+	+	+++
Do	([a])	—	—	+	—

[a] Control.

To test the virulence of the four Shiga strains isolated from carriers 2, 6, M. Rey., and 4, and the five Flexner strains isolated from carriers 1, 7, 3, 2, and 5, the corresponding cultures were injected into white mice subcutaneously, at the root of the tail. All the mice injected with the Shiga strains died, and *B. dysenteriæ*, Shiga type, was recovered from their heart blood. The mice injected with the Flexner strains became sick but did not die, except the mouse injected with the culture from carrier 5, which died twenty days after injection, from some other cause. The rest of the mice that remained alive as well as a normal control mouse, received one slant of a twenty-four-hour culture on acid agar of a known virulent Shiga strain. The carrier-1, the carrier-7, and the control mice died within one day after injection, and *B. dysenteriæ*, Shiga type, was recovered from their heart blood. The carrier-3 mouse died three days after injection, but *B. dysenteriæ* Shiga was not recovered from its heart blood.

From each of the first four Shiga strains isolated from carriers 2, M. Rey., 4, and 6, toxin was prepared, as follows: From each strain ten acid agar slants were planted. The cultures were incubated forty-eight hours. The growth was washed off, using 2 cubic centimeters of salt solution for each culture tube. The emulsion thus obtained was poured into an Erlenmeyer flask containing glass beads, and shaken. Then it was heated at 60° C. for one hour, carbolized to contain 0.5 per cent phenol, and stored in the ice box. Then it was filtered through a Berkefeld filter. One cubic centimeter of the filtrate was injected intravenously into a rabbit weighing between 1,500 and 1,800 grams.

The rabbit injected with the carrier-2 Shiga toxin died seven days after injection. It was posted and examined. No dilation of the urinary bladder was observed; nor were hæmorrhages or œdema of the mucous membrane of the cæcum noted. There was only hyperemia of the peritoneal cover of the intestines.

The rabbit injected with the carrier-4 Shiga toxin showed paralysis of the front legs on the eighth day after injection, and remained paralyzed for three days. On the fourth day it recovered.

The rabbits injected with the carrier-6 Shiga toxin and the M. Rey. Shiga toxin showed no symptoms, although as much as 5 cubic centimeters of the toxin was injected. The animals were observed for two weeks after the last injection, but they never showed any symptoms of dysentery toxin.

DISCUSSION

The nature of dysentery carriers is not well established. It is unlikely that the gall passages are invaded at all by *B. dysenteriæ*. Chronic inflammation and eventually ulceration of the large intestine would seem to offer a more plausible explanation for the persistence of the carrier state in bacillary dysentery; the histories and serological evidence in the ten cases here discussed lend support to this supposition. A study of the distribution of *B. dysenteriæ* throughout the intestinal tract of dysentery cases is necessary before a definite idea can be formed as to the organ or organs responsible for the state of dysentery carriers. Systematic bacteriological examination of autopsies would probably throw much light on this subject.

The discrepancies between the results of the present investigations and the former ones (7) is rather difficult to explain, as the same technic was used. It may be conjectured that the specimens were examined in a fresher condition, or it may be that the outbreak of the present year was more extensive than the one that occurred in 1923. The occurence of the carriers from April (2 carriers) to May (3 carriers), to July (6 carriers), to August (2 carriers), to September (1 carrier), corresponds well to the seasonal annual occurrence of outbreaks of bacillary dysentery in the Philippines. The number of carriers appears to increase parallel to the number of cases. The opinion expressed on another occasion,(7) "That at the present time the chronic carrier is not as serious a factor in the epidemiology of typhoid and dysentery as he has previously been considered to be," must be corrected.

Once the existence of healthy carriers of *B. dysenteriæ* has been demonstrated by laboratory evidence in a relatively high percentage of the food handlers examined, the dysentery carrier must be considered as a serious factor in the epidemiology of bacillary dysentery, at present as well as in the future, even though he remain undiscovered.

SUMMARY

1. The existence of healthy carriers of *B. dysenteriæ* in the Philippine Islands has been demonstrated.

2. The proof was carried out by isolation of cultures which, according to standard methods of identification, proved to be *B. dysenteriæ.*

3. In 3,328 examinations 14 carriers were found, of whom 7 harbored the Shiga type, 6 the Flexner type, and 1 both Flexner and Shiga types, successively.

4. Agglutination tests were performed with the carriers' sera and with the corresponding culture isolated from the carriers, as well as with stock cultures of the Shiga and the Flexner types. Usually the serum of the carrier agglutinated its own strain to a lesser degree than the stock cultures, and at times a considerable inhibition zone was noticed with the carrier's serum and its own strain.

5. All of the cultures belonging to the Shiga type, isolated from the carriers, were pathogenic for white mice, and some of them were strongly toxic to rabbits. The cultures belonging to

the Flexner type, isolated from carriers, were found to be of low virulence.

ACKNOWLEDGMENT

Thanks are due to Dr. Otto Schöbl, Bureau of Science, for checking the agglutination and carbohydrate tests under such conditions that the factor of personal equation was eliminated, as well as for other assistance in the preparation of this paper.

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THE POSSIBLE USE OF PHILIPPINE COALS FOR LIQUID FUEL

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As certain low-grade Philippine coals cannot be used advantageously as such under the boiler because of their rapid disintegration into powder, a study was made with reference to their utilization in the powdered form, by mixing with crude oil. The preparation of this liquid fuel forms the subject of this paper.

Cox[1] characterizes the Philippine coals as "ideal to handle in a producer furnace," and considers that, "For the production of power, the utilization of our low-grade and outcrop coals for producer gas seems much more promising than any other scheme which has yet been devised for their use."

The latest reference found in the literature is that by Bates;[2] namely,

> where petroleum oils are associated with colloidal carbon derived from powdered coal or the like, and maintained in colloidal condition by the action of coal tar, creosote and lime rosin grease, and where powdered coal of larger than colloidal size may also be associated with the fuel.

To obtain a stable mixture for use as fuel in engines, the "suspension-sized" particles are removed from a similar mixture by centrifuging, dilution and sedimentation, or filtration.[3] A British patent for a "fuel to be sprayed on the bed of a furnace" prepares the fuel[4] by grinding into a very fine state a mixture of 5 to 10 parts of tallow, soap, or other fatty substance, 30 parts of coal or other carbonaceous solid, and 59 to 64 parts of crude oil, such as petroleum or tar oil; the mixture is passed through a grinding machine or a colloidal mill.

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[1] Philip. Journ. Sci. 1 (1906) 901.

[2] U. S. Patent 1447008, February 7, 1923.

[3] Bates, L. W., U. S. Patent 1144723, February 6, 1923.

[4] Leadbeater, J. A., Brit. Patent 191201, October 20, 1921.

Pickering[5] prepared emulsions of paraffin oil in water, using different emulsifiers. He found that solutions of potassium soap, glue, flour, milk, starch, saponin, etc., and insoluble precipitates like calcium oxide, and the basic sulphates of iron and copper act as emulsifiers for this oil. Furthermore, he noticed that solids that are not sufficiently fine-grained, will form "quasi-emulsions," if present in considerable proportions. The "quasi-emulsion" has many of the properties of a true emulsion, but is not homogeneous, and precipitates sooner or later.

Hildebrand and his students[6] cited a case of lampblack as a stabilizer in an emulsion of water in benzene, and from a compilation of data gave a theoretical explanation for the relative stabilizing power of the soaps of caesium, potassium, sodium, calcium, silver, magnesium, zinc, aluminum, and iron. He verified some of his predictions by measurements of the size of the drops formed due to the presence of the soaps. According to his conclusions, the emulsion of oil in water is more stable when potassium soap is used than when sodium soap is used as a stabilizer, while the drops formed with sodium soap are larger.

Although coal alone, in a finely powdered form, might act as an emulsifier for the formation of this "quasi-emulsion" of crude oil, somewhat similar to the patents of Bates (and experiments would seem to indicate that such is really the case), the amount of coal utilized in this way is so small and the coal so fine-grained that for practical purposes this method seems inadequate.

The addition of soap solution to the oil has the effect of producing an emulsion and increasing the viscosity of the liquid medium. It is doubtful that the increase of the viscosity of the medium is the greatest factor in the suspension of the coal particles, but it has been found that the addition of the soap solution effects the suspension of the particles for a few days and produces a soft jellylike mass that does not wet a glass beaker and is easily stirred. The mass seemed to be in equilibrium with the oil left as unused.

According to Stokes,

$$v = \frac{2r^2 (s - s_1) g}{9n}$$

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[5] Journ. Chem. Soc. 91 (1907) 2001.

[6] Journ. Am. Chem. Soc. 45 (1923) 2780.

where,

v=rate of fall of the particle in suspension,
r=radius of the particle,
s=specific gravity of the particle,
s_1=specific gravity of the liquid medium,
g=gravitation constant,
n=coefficient of viscosity of the liquid,

so that, if the radius of the particle were 60 μ, $s-s_1 = 1$, and n = 0.10, the velocity of the particle would be 4.7 centimeters per minute. If the radius of the particle were 6 μ, the velocity of the particle would be 2.8 centimeters per hour; and if the radius of the particle were 0.6 μ, the velocity would be 4.7 centimeters per week.

It is evident from Stokes's formula that the greatest factor in the length of suspension of a particle is its diameter. For industrial purposes, however, the grinding of coal to pass a sieve of fineness greater than 200-mesh, may mean so great a cost as to prohibit its utilization. Another great factor in the length of suspension of a particle is the viscosity of the liquid medium, while another one, of no less importance, is the difference between the specific gravity of the medium and that of the particle to be suspended.

STATEMENT OF THE PROBLEM

The problem is to produce an emulsion of oil, either of sufficient viscosity and with the same specific gravity as that of the coal particles, or of such stabilizing properties as would retain the coal particles (passing through a 200-mesh sieve) in suspended form for a reasonably long time, and take back into suspension the precipitated particles when the mixture is stirred; that is, a "reversible" suspension of coal, the resulting mixture possessing qualities as specified by standard oil tests.

Sheppard[7] outlines some of the possibilities in colloidizing the fuel problem thus:

(*a*) Production of stable suspensions of coal powders in fuel oils of medium viscosity, stabilized by protective colloids.

(*b*) Production of coal and carbon dispersions of colloid dimensions in oils of lower viscosity, stabilization assisted by protective colloids.

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[7] The Theory and Application of Colloidal Behavior, edited by R. A. Bogue, McGraw-Hill Book Co., New York 2 (1924) 537; also E. S. Sheppard, Journ. Ind. Eng. Chem. 13 (1921) 37.

(*c*) Semicolloid dispersions of coal by solvent peptization by tars and tar distillates in oils and mixture of oils and tars.

(*d*) Chemical peptization of powdered coals by hydrous and anhydrous oxidizing agents, followed by amalgamation to plastic fuels or stabilization to colloidal fuels.

(*e*) Hydrogenation of coal, of mechanical mixture of coal and oil, of colloid composites of coal and oil, or of coal, tars and oils, including pitches and cognate materials.

It is along the line indicated in (*a*) that we are at present concerned.

The emulsification of crude oil with soap has the effect of increasing the viscosity of the liquid, and the more coal there is suspended, the higher the viscosity of the resulting mixture becomes, so that in the suspension of the coal particles, there results the advantage of this increase in the time of their suspension aside from the increase due to the emulsification with the soap.

MATERIALS USED

Four kinds of Philippine coal were used; namely, the Gotas, the East Batan, the Butong, and the Cebu. The Gotas, which is mined in Zamboanga, Mindanao, is bituminous; it is generally sold in small lumps, and disintegrates slightly. The East Batan coal is lignitic; it disintegrates on exposure to the air, and has a tendency toward spontaneous combustion. The Butong coal comes from Mindanao; it is a semi-anthracite, and is generally not readily combustible in furnaces designed for bituminous coal. The Cebu coal is lignitic; it disintegrates on ordinary exposure, and is liable to spontaneous combustion if the pile is a meter thick. The sample used was dry, as it had been standing for a long time. The proximate analyses of these coals are as follows:

TABLE 1.—*Analyses of coals used in liquid fuel experiments.*

Coal.	Moisture.	Volatile combustible matter.	Fixed carbon.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Gotas	3.16	24.08	61.12	11.64
East Batan	9.38	43.83	38.74	8.05
Butong	2.60	11.26	74.52	11.62
Cebu (Uling)	1.85	32.28	42.28	23.59

In all the experiments coal particles which passed through a 200-mesh sieve were used. Therefore, although the maximum radius of the coal particles is about 30 μ, the minimum is much less, and it may be assumed that a large percentage of the particles have radii ranging from 10 to 20 μ.[8]

The oil is the ordinary crude oil used in the Bureau of Science power plant; the following is a résumé of its properties, as determined by Mr. Walter L. Brooke, of the Bureau of Science:

Flash point (United States Bureau of Mines flash-point tester) °C.	100
Carbon residue (per cent)	1.82
Viscosity (Saybolt Universal) at—	
26° C. (seconds)	64.4
28° C. (seconds)	61.8
30° C. (seconds)	59.8
32° C. (seconds)	57.4

PREPARATION OF THE OIL EMULSION AND SUSPENSION

The soap solution was emulsified and the oil was added to this, drop by drop, and the mixture stirred by means of a motor until a fine consistency was reached when the oil can be added in greater quantities at a time, stirring being continued.

For the preparation of the suspension of coal in the oil emulsion, definite quantities of the coal were weighed and the emulsion was gradually added until a definite weight of emulsion had been utilized, the process having been carried on with constant stirring. Reversing the method (that is, adding the carbon to the emulsion), has the effect of destroying the emulsion and thus allowing the rapid settling of the carbon particles.

PREPARATION OF THE SOAP

From the saponification number of the coconut oil used, it was calculated that 100 grams of the oil require 425.6 cubic centimeters of 0.1 *N* alkali solution. These were mixed, evaporated slowly for a long time with stirring in a water bath, and made up to 500 cubic centimeters. One cubic centimeter of the solution, which may be called *A*, contains, therefore, 0.234 gram of sodium soap and glycerine, or 0.2475 gram of potassium soap and glycerine.

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[8] According to H. Kreisinger and J. Blizard, the size of the coal particles passing through a 200-mesh sieve varies from 2 μ to 60 μ, most of them having a mean diameter of between 20 μ and 60 μ. Journ. Ind. Eng. Chem. 15 (1923) 249–251.

TABLE 2.—*Relation of soap and water contents to stability of the emulsion and suspension.*

Sample No.	Soap content.	Water content.	Oil content.	Life emulsion.	Life suspension.	Remarks on suspension.
POTASSIUM SOAP.						
	Per cent.	*Per cent.*	*Per cent.*	*Days.*	*Days.*	
1	4.5	13.9	81.6	90	120	Easy to stir.
2	3.6	10.9	85.5	90	120	Do.
3	2.5	7.7	89.8	49	120	Do.
4	1.5	4.0	94.5	2	2	Hard to stir.
5	2.2	16.1	81.7	7	120	Easy to stir.
6	1.8	12.6	85.6	4	120	Do.
7	1.3	8.8	89.9	2	120	Do.
8	0.5	4.7	94.8	1	14	Hard to stir.
9	1.2	17.1	81.7	4	120	Easy to stir.
10	0.8	13.5	85.7	2	120	Do.
11	0.5	9.5	90.0	([a])	14	Hard to stir.
12	0.3	5.0	94.7	([a])	([a])	Do.
13	0.4	17.8	81.8	3	5	Do.
14	0.3	14.0	85.7	2	5	Do.
15	0.2	9.8	90.0	1	([a])	Do.
16	0.15	5.15	95.7	([a])	([a])	Do.
SODIUM SOAP.						
1	4.2	14.2	81.6	90	120	Easy to stir.
2	3.3	11.2	85.5	60	120	Do.
3	2.35	7.8	89.8	3	120	Do.
4	1.2	4.1	94.7	0.5	1	Hard to stir.
5	2.1	16.2	81.7	4	120	Easy to stir.
6	1.7	12.7	85.6	3	120	Do.
7	1.2	8.9	89.8	0.84	60	A little hard to stir.
8	0.6	4.7	94.7	([a])	([a])	Hard to stir.
9	1.1	17.2	81.7	5	7	Easy to stir.
10	0.9	13.5	85.6	3	7	A little hard to stir.
11	0.6	9.6	89.8	1	2	Hard to stir.
12	0.3	5.0	94.7	([a])	([a])	Do.

[a] Instantaneous.

EFFECT OF WATER CONTENT AND SOAP CONTENT ON THE EMULSION

In order to determine the effects of the water and soap content of the emulsion on its stability, different mixtures containing different amounts of soap and water and the same amount of crude oil were prepared. One series of emulsions was prepared so as to contain 10, 20, 30, and 40 cubic centimeters of soap solution *A*, respectively, and 200 cubic centimeters of oil. The other series contained 10, 20, 30, and 40 cubic centimeters of aqueous soap solutions of dilution A/2, A/4, and A/10, respectively, and 200 cubic centimeters of oil.

A portion of each emulsion was used for the preparation of the corresponding suspension.

A comparison of the different emulsions in each series shows that the emulsions containing more water and soap are softer and more stable. The emulsion containing 200 cubic centimeters of oil and 10 cubic centimeters of A/10 soap solution was very hard but coagulated within a few minutes; the emulsion containing 200 cubic centimeters of oil and 40 cubic centimeters of A/1 soap solution remained stable for more than three months. The fact that samples like No. 3, which contained 10 cubic centimeters A/1 soap solution per 100 cubic centimeters of oil, have a greater viscosity than samples like No. 5, which contained the same amount of soap but double the amount of water, shows that the high water content is responsible for the low viscosity of the emulsion. However, the soap content has also an effect on the viscosity, as is shown by the fact that, although the time required for, say, No. 1 sample to flow from an Engler viscometer is two hours forty-five minutes at room temperature (28° to 29° C.), the time required for samples 5 and 9, with the same water content but different soap content, is much less; namely, twenty-six and twenty-two minutes, respectively. In general, the smaller the percentage of water, the greater the viscosity but the less the stability of the emulsion; and the greater the percentage of soap, the greater the viscosity and also the stability of the emulsion.

Furthermore, a comparison of Tables 1 and 2 reveals the fact that both of the emulsions and suspensions of potassium soap are more stable than those of the sodium soap.

EFFECT OF THE SOAP AND WATER CONTENT ON THE SUSPENSION

The smaller the percentage of water and the greater the percentage of soap, the greater the viscosity of the emulsion formed. However, as soon as the emulsion is added to the powdered coal, the viscosity of the resulting mixture decreases. If only a small amount of coal is used, the viscosity decreases considerably, and after a time some residual oil separates at the top; but the more the percentage of coal is increased the greater the viscosity of the suspension becomes and the less the residual oil separated, until a semisolid mixture is formed. In this connection, it may be pointed out that briquets may be produced in this way, adding more and more coal until the mass becomes very solid, and possibly using some kind of binder.

Furthermore, it has been observed that the greater the percentage of both soap and water, the more stable the suspension, that is, the longer the coal particles stay in suspension without showing visible signs of separation from the oil mixture. Even if the percentages of soap and water are large, if the emulsion has been destroyed before mixing with the coal, the resulting suspension is just as if no soap had been added at all (that is, very short-lived) and the precipitated mass is very sticky. As has already been pointed out, the potassium soap produced a greater stability in the suspension. The life of the suspensions varied from two days to more than four months.

CONDITIONS FOR THE BEST SUSPENSION WITH SOAP

From the different percentages of soap and water used, it was found that the best suspensions were prepared with the following emulsions:

TABLE 3.—*Showing emulsions used for preparing the best suspensions.*

Sample No.	Emulsion.		Suspension.	
	Water by weight.	Sodium soap.	Water by weight in suspension.	Sodium soap in suspension of 46 per cent coal.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1	14.2	4.2	7.7	2.3
2	11.2	3.3	6.0	1.8
3	7.8	2.4	4.2	1.3
5	16.2	2.1	8.7	1.1
6	12.7	1.7	6.9	0.9
7	8.9	1.2	4.8	0.7

For greater stability of the suspension, that is, for a longer time of settling and greater ease of stirring, emulsions 1 and 5 should be used; the disadvantage in these suspensions is that 7.7 per cent and 8.7 per cent, respectively, of water are present, which decreases the efficiency of the fuels. Suspensions 3 and 7, on the other hand, contain only 4.2 per cent and 4.8 per cent water, respectively, and would therefore have greater fuel value. Suspension 3 has the advantage over suspension 7 in that 3 contains more soap and is therefore more stable, and contains less water. Of course, the most suitable mixture would depend upon the type of burner used, the viscosity, and the available pressure.

"REVERSIBILITY" OF THE SUSPENSION

While it has been observed that suspension of powdered coal in oil without the aid of soap and water is possible, the time of settling is so short that after one hour the great bulk of the coal settles as a hard sticky mass which is difficult to stir. The more stable the emulsion, the more nearly perfect is the soft jellylike mass which produces no wetting of the beaker, and the easier it is to stir the mass to the original state.

DIFFERENCES DUE TO THE DIFFERENT VARIETIES OF COAL

Although the maximum percentage of powdered coal in the suspension is approximately the same for all the varieties of coal used, there are differences which may be due to their chemical composition. In this connection, it is interesting to note that the Batan and the Cebu coals, which have fairly high percentages of volatile combustible matter, do not give as good suspensions as the Gotas and the Butong coals, which are low in volatile combustible matter.

Table 4 gives the calorific values of each separate constituent and of their mixtures with soap and water.

TABLE 4.—*Calorific values of each kind of fuel used and of each emulsion and suspension prepared.*[a]

[Observed calorific value of crude oil, 10620; Gotas coal, 7266; Batan coal, 5720; Butong coal, 6765; Cebu coal, 5285.]

Soap.[b]	Water.	Oil.	Coal.	Observed calorific value.	Calculated calorific value.	Error.
EMULSION.						
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*			*Per cent.*
4.2 (A)	14.2	81.6	------------	9,800	(c)	
3.3 (A)	11.2	85.5	------------	9,840	9,970	1.3
4.5 (B)	13.9	81.6	------------	9,790	(c)	
3.6 (B)	10.9	85.5	------------	10,150	9,980	1.7
2.5 (B)	7.7	89.8	------------	10,300	10,165	1.3
GOTAS COAL SUSPENSION.						
1.8 (A)	6.0	46.2	46.0	8,670	8,675	0.0
1.1 (A)	8.7	44.2	46.0	8,380	8,275	1.2
0.9 (A)	6.9	46.2	46.0	8,420	8,435	0.2
0.7 (A)	4.8	48.5	46.0	8,720	8,630	1.0

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[a] According to E. S. Sheppard, "The percentage of dispersed solid phase must be of the order of 30 per cent or upwards by weight, in order to secure economically significant results." This is why no effort has been made to determine the calorific value of any mixture below 37 per cent coal.

[b] (A) denotes that sodium soap is used; and (B) denotes that potassium soap is used.

[c] The heat values corresponding to the soap contents of these particular samples are taken as the basis of calculation, that is 270 calories to 1 per cent sodium soap, and 250 calories to 1 per cent for potassium soap.

TABLE 4.—*Calorific values of each kind of fuel used and of each emulsion and suspension prepared*—Continued.

Soap.	Water.	Oil.	Coal.	Observed calorific value.	Calculated calorific value.	Error.
BATAN COAL SUSPENSION.						
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*			*Per cent.*
2.1 (A)	7.5	43.2	47.0	7,780	7,785	0.0
1.8 (A)	5.9	45.3	47.0	7,880	7,925	0.6
1.3 (A)	9.1	47.6	47.0	7,840	8,000	2.0
1.1 (A)	8.6	43.3	47.0	7,540	7,525	0.2
0.9 (A)	6.7	45.4	47.0	7,710	7,695	0.3
0.7 (A)	4.7	47.6	47.0	7,950	7,940	0.1
CEBU COAL SUSPENSION.						
2.75 (A)	8.7	50.8	37.8	7,980	8,110	1.6
2.4 (A)	8.0	46.4	43.2	7,820	7,865	0.6
1.9 (A)	6.3	48.6	43.2	8,030	7,965	0.8
1.9 (A)	4.8	55.9	37.8	8,140	8,330	2.3
1.3 (A)	4.4	51.1	43.2	8,205	8,070	1.6
1.3 (A)	7.9	53.0	37.8	8,085	7,990	1.1
2.8 (B)	8.7	50.7	37.8	7,800	8,085	3.7
2,6 (B)	7.9	46.3	43.2	7,780	7,845	0.8
2.2 (B)	6.0	48.6	43.2	7,940	7,980	0.5
BUTONG COAL SUSPENSION.						
2.7 (A)	8.9	51.7	36.7	8,450	8,705	3.0
2.5 (A)	8.1	47.4	42.0	8,410	8,540	1.5
2.1 (A)	7.0	54.2	36.7	8,735	8,810	0.8
2.0 (A)	6.4	49.6	42.0	8,660	8,640	0.2
1.4 (A)	4.5	52.1	42.0	8,790	8,750	0.5
1.4 (A)	8.0	53.9	36.7	8,630	8,575	0.6
2.9 (B)	8.8	51.6	36.7	8,405	8,675	3.2
2.6 (B)	8.1	47.3	42.0	8,385	8,515	1.5
2.4 (B)	6.8	54.1	36.7	8,660	8,770	1.3
2.2 (B)	6.2	49.6	42.0	8,540	8,655	1.4
1.6 (B)	4.9	56.8	36.7	8,820	8,910	1.0
1.4 (B)	4.5	52.1	42.0	8,695	8,730	0.4

THEORETICAL

The oil-water-coal mixture has always been referred to as a suspension of coal in the oil-water emulsion. There are indications, however, that the mixture is, partly at least, an emulsion of oil in water, where the particles of coal act as pellicles or as a coating surrounding the oil globules to prevent them from coalescing. It has been pointed out that the jellylike fluid mass, formed after the addition of coal to the oil-water emulsion, does not wet the beaker. This would show that the oil globules are enveloped in some sort of covering. Furthermore, when a small amount of the coal mixture is dropped into a beaker of water, dark mercurylike globules are formed at the bottom; if the oil-water emulsion and the coal particles were entirely independent of each other, there should have been a separation between them in presence of the water, the coal particles falling to the bottom as an irregular mass, and the oil emulsion remaining on the surface of the water and de-emulsifying. Lastly, microscopic analysis shows that there are many oil globules ranging from 2 to 4 μ in diameter, which are really surrounded by dark coatings, presumably the coal particles, the diameter of the entire globules with their coatings ranging mostly between 40 and 120 μ.

While, therefore, it may not be accurate to state that the mixture is totally an emulsion of oil in water, where the soap and the coal particles act as emulsifiers or stabilizers, it is safe to assume that a portion of this mixture is composed of the emulsion just described, the rest of the coal being simply suspended in the viscous emulsion. Whether it is possible to prepare a complete emulsion of the type described remains to be seen; but, in view of the fact that the globules are very large, it is hardly to be expected that the emulsion would remain permanently.

SUMMARY

The work undertaken was confined purely to the use of soap solutions for the production of coal suspensions.

Various patents use tar mixed with oil and soap. It may be pointed out that tar mixed with coal produces a very viscous mixture, which does not settle for a long time. When crude oil is mixed with the tar, the suspended carbon in the tar precipitates. When an oil emulsion in water, stabilized by soap, is mixed with the tar, and coal mixed with it, a stable mixture of the fuel is produced. As tar is being produced as a by-product by one of the local manufacturers, experiments were carried out to determine the conditions under which this material could be used as a stabilizer. It was found that there is a wide range within which tar could be utilized. However, in order that the liquid mixture may conform to any specification to be prescribed for its utilization, further experiments are necessary.

Another problem worthy of study is the determination of the maximum diameter of the coal particles that would remain in suspension for a reasonably long time, under varying conditions.

Philippine coal suspensions with soap take the form of a soft jellylike fluid mass which keeps for months. The gross calorific value of the suspension is equal to the sum of the calorific values of each constituent, while, of course, the true heating power will be decreased in proportion to the quantity of water added and water formed by the combustion of the coal.

The study of the behavior of this liquid fuel under ordinary burning conditions would be interesting.

ACKNOWLEDGMENT

This work was undertaken at the suggestion of Dr. T. Dar Juan, of the Bureau of Science.

NEW MALAYSIAN CERAMBYCIDÆ; SUBFAMILY LAMIINÆ

By W. S. FISHER

Of the Bureau of Entomology, United States Department of Agriculture

This paper gives the results of work on a collection of Cerambycidæ received from Prof. Charles Fuller Baker, dean of the College of Agriculture, University of the Philippines, Los Baños, P. I., to whom I am greatly indebted for the privilege of studying this interesting material.

Nearly all of the species included in the present paper belong to the subfamily Exocentrinæ, as designated by Pascoe;[1] but, under the present classification, they have been distributed among a number of tribes. The beetles in the groups represented are all small and are usually neglected by most collectors, and very little work has been done on the species from the Malaysian Region since Pascoe published his *Longicornia malayana*. Furthermore, since Pascoe had very little material from the regions covered by the present paper, the larger percentage of the species examined are new.

I had intended to make a revised classification of these forms from the Malaysian Region; but, since the species known are scattered over all the islands in that region, and at present material from only a few localities is at hand, it seems advisable at this time simply to describe the new forms, so that the names will be available for use. Perhaps this will stimulate collectors in different parts of the region to search for and secure specimens of these interesting beetles. As soon as sufficient material can be accumulated from the various islands to give us a fair representation of the fauna and a fair knowledge of the distribution and variation of the species, a revisional study will be made of the tribes, the paper to include tables for the separation of the species, so that students will be able to identify the forms from that region.

Through the kindness of Professor Baker, all the types of the new species have been deposited in the United States National Museum.

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[1] Trans. Ent. Soc. London III 3 (1864) 26–56.

All of the specimens, unless otherwise noted, have been collected by Professor Baker, and much credit is due him for his energetic collecting and his additions to our knowledge of the insect fauna of that region.

Enispia pulchra sp. nov.

Female.—Head black; pronotum brownish black, with the anterior and posterior margins slightly paler; elytra brownish black, with apical half and a broad band extending obliquely backward from humeri to suture in front of middle reddish yellow; there is also a reddish yellow area at scutellum, and a narrow band of the same color along suture connecting the oblique fasciæ with the posterior reddish yellow area; beneath pale brownish yellow, becoming darker on the median parts.

Head flat between the antennal tubercles, the surface rather densely circumvallato-punctate (each puncture deeply impressed, with an elevated ring around margin), sparsely clothed with short inconspicuous pubescence, and with a few long erect black hairs intermixed; mandibles reddish brown, the margins blackish; palpi yellowish brown. Antennæ uniformly brownish black, densely coarsely punctate, except apex of joints which is smooth, sparsely clothed with short obsolete pubescence, and with short stiff erect hairs and longer flying hairs intermixed; scape feebly arcuate. Pronotum only obsoletely wider than long, base and apex about equal in width; sides feebly arcuate at middle, and parallel on basal fifth; surface transversely grooved near base and anterior margin, the basal groove rather deeply impressed, the anterior one only feebly indicated, nearly smooth, very sparsely clothed with inconspicuous pubescence, and with a few long erect stiff hairs intermixed. Scutellum broadly rounded behind. Elytra distinctly wider than pronotum at base, sparsely, coarsely, and irregularly punctate on basal half, the punctures forming indistinct rows and becoming somewhat scabrous at base, the surface very sparsely clothed with inconspicuous pubescence, each elytron ornated with cinereous pubescence (except the oblique fascia, which is composed of yellowish hairs) as follows: A narrow fascia on the pale area, extending from humerus obliquely backward to near suture, a small vitta along suture behind scutellum, a transverse spot along lateral margin behind humerus, a rather wide, very distinct transverse fascia on anterior part of apical pale area, an obsolete, sparsely clothed transverse fascia at middle, and an obsolete area of sparsely placed hairs near apex; there are also numerous long stiff erect hairs over the entire surface.

Beneath finely densely punctate, and rather densely clothed with moderately long cinereous hairs, the hairs longer and more yellowish on the legs, where there are numerous longer erect stiff ones intermixed; last abdominal segment slightly concave at apex, with an obsolete longitudinal median carina.

Length, 4.2 millimeters; width, 1.5.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality (*Baker 13509*). This species is more closely related to *Enispia venosa* Pascoe than the other species described in the present paper. It differs, however, from that species in a number of ways; the pronotum is nearly glabrous, and the apical half of the elytra reddish yellow, margined anteriorly by a transverse fascia of cinereous hairs, whereas in *venosa* the pronotum is clothed with conspicuous grayish pubescence, and the elytra chestnut brown, with a large grayish blotch covering apical third, and margined anteriorly by an arcuate fascia of cinereous pubescence on each elytron.

Enispia similis sp. nov.

Male.—Head and pronotum brown, the latter slightly more reddish along anterior and posterior margins; elytra reddish yellow, each elytron ornamented with dark brown markings as follows: A broad crescent-shaped spot at base near scutellum, a broad transverse fascia at middle, with the posterior margin arcuate and distinctly defined and the anterior margin irregular, obsolete, and blending into the pale area, and a rather large irregularly shaped spot at apical fourth, situated closer to suture than to the lateral margin; beneath brownish yellow, femora more or less dark brown.

Head flat between the antennal tubercles, a narrow longitudinal groove extending from occiput to front, the surface sparsely, obsoletely circumvallato-punctate, densely clothed with moderately long yellowish pubescence, and with numerous long erect hairs intermixed; mandibles reddish brown, becoming black at tips; palpi yellowish brown. Antennæ reddish brown, with base of joints paler, densely coarsely punctate, except apex of joints which is smooth, densely clothed with short yellowish pubescence, and with numerous long stiff hairs intermixed; scape slightly arcuate. Pronotum one and one-fifth times as wide as long, distinctly narrower at base than apex; sides strongly arcuate at middle, feebly constricted near apical angles, and parallel on basal fifth; surface deeply transversely grooved near base and anterior margin, nearly smooth, sparsely clothed with inconspicuous brownish pubescence, with a few long erect hairs intermixed, and ornamented with a transverse zigzag median fascia of yellowish white pubescence. Scutellum triangular, rather acutely angulated behind. Elytra distinctly wider than pronotum at base, with rows of irregularly and widely placed punctures, the punctures coarse at base but becoming more obsolete toward apex, the surface rather densely clothed on the dark brown area with short brown pubescence, and on the reddish yellow areas with coarser, longer yellowish white pubescence; there are also numerous long stiff erect hairs over the entire surface. Beneath densely, finely punctate, densely clothed with short whitish pubescence, and with numerous long stiff erect hairs on legs; last abdominal segment broadly rounded at apex; anterior tibiæ slightly swollen at middle; femora with an oblong, more or less depressed area on the outer surface near apex.

Length, 5.5 millimeters; width, 2.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from one male collected at the type locality (*Baker 13508*). This species is very closely related to *Enispia ornata* sp. nov. and *E. fusca* sp. nov. From *ornata* it can be separated by the antennal joints being paler at base, and the dark median spot on the elytra not so distinct, with the posterior margin arcuate and the anterior margin not distinctly indicated. From *fusca* it can be distinguished by the paler color, pronotum not much wider than long, the posterior margin of the dark median spot arcuate, and the last abdominal segment broadly rounded at apex.

Enispia ornata sp. nov.

Male.—Head and pronotum brown, the latter slightly more reddish along anterior and posterior margins; elytra reddish yellow, each elytron ornamented with dark brown markings as follows: A large triangular spot at base; a small elongate spot along suture behind scutellum; two small spots in the anterior pale oblique area, the external one more or less obsolete; a broad transverse fascia at middle, wider at lateral margin, the posterior margin transverse, and the anterior margin oblique and somewhat irregular; and three more or less distinct spots placed in the form of a triangle in the pale apical area; beneath dark brown, sternum, base of femora, tibiæ, and tarsi brownish yellow.

Head flat between the antennal tubercles, with a narrow longitudinal groove extending from occiput to epistoma, the surface sparsely, obsoletely circumvallato-punctate, rather densely clothed with moderately long yellowish pubescence, and with numerous long erect hairs intermixed; mandibles reddish brown, becoming black at apex; palpi yellowish brown. Antennæ uniformly reddish brown, densely coarsely punctate, sparsely clothed with short cinereous pubescence, and with numerous long stiff erect hairs intermixed; scape not arcuate. Pronotum one and one-fifth times as wide as long, slightly narrower at base than apex; sides rather strongly arcuate at middle, obsoletely constricted near apical angles, and parallel on basal fifth; surface deeply transversely grooved near base and anterior margin, nearly smooth, sparsely clothed with inconspicuous brownish pubescence, with a few yellowish hairs intermixed, but not forming distinct designs, and also with the usual erect hairs. Scutellum broadly rounded behind. Elytra distinctly wider than pronotum at base, with rows of coarse, widely separated punctures, which become obsolete toward apex, the surface rather densely clothed with fine short recumbent brown pubescence on the dark areas, and with slightly coarser whitish pubescence on the reddish yellow areas; there are also numerous long stiff erect hairs over the entire surface. Beneath finely, densely punctate, densely clothed with short recumbent cinereous pubescence, and with numerous longer hairs on the legs; last abdominal segment broadly rounded at apex; anterior tibiæ nearly straight and not swollen at middle; femora with a large oblong flattened area on the outer surface near apex.

Length, 5 millimeters; width, 1.75.

Type locality.—Mount Banahao, Luzon, Philippines.

Type in United States National Museum.

Described from one male collected at the type locality.

Enispia fusca sp. nov.

Male.—Head and pronotum black, the latter with the anterior and posterior margins slightly reddish brown; elytra black, each elytron ornamented with obsolete reddish brown areas as follows: An inconspicuous broad oblique fascia extending from humerus to suture at middle, and the apical third inclosing a number of small irregularly placed dark spots; beneath blackish brown, tips of femora, tibiæ, and tarsi paler reddish brown.

Head flat between the antennal tubercles, with a narrow longitudinal groove extending from occiput to epistoma, the surface sparsely, obsoletely circumvallato-punctate, rather densely clothed with moderately long yellowish pubescence, and with numerous long erect hairs intermixed; mandibles brownish black; palpi yellowish brown. Antennæ reddish brown, the outer joints slightly paler at base, densely coarsely punctate, except apex of joints which is smooth, rather densely clothed with short recumbent cinereous pubescence, and with numerous long stiff hairs intermixed; scape not arcuate. Pronotum one and two-fifths times as wide as long, slightly narrower at base than apex; sides strongly arcuate at middle, feebly constricted near apical angles, and parallel on basal fifth; surface deeply transversely grooved near base and anterior margin, nearly smooth, sparsely clothed with very short cinereous pubescence, and ornamented with a transverse zigzag median fascia of longer yellowish white pubescence. Scutellum broadly rounded behind. Elytra distinctly wider than pronotum at base, with rows of coarse, widely separated punctures, which are somewhat scabrous at base but become more obsolete toward apex, the surface rather densely clothed on the dark areas with inconspicuous blackish pubescence, and on the paler areas with longer, coarser yellowish white hairs; in the anterior oblique area, these yellowish hairs are much denser and longer anteriorly, and form a more or less distinct irregular transverse fascia just behind base; there are also numerous long stiff erect hairs over the entire surface. Beneath densely finely punctate, densely clothed with short recumbent cinereous pubescence, and with numerous longer hairs intermixed, the long hairs becoming stronger and more erect on the legs; last abdominal segment broadly truncate at apex; anterior tibiæ slightly arcuate; femora with a large, more or less depressed area on outer surface near apex.

Length, 6 millimeters; width, 2.25.

Type locality.—Cuernos Mountains, Negros, Philippines.

Type in United States National Museum.

Described from a unique male collected at the type locality.

Genus **CALLIENISPIA** novum

Form of *Enispia.* Head not retractile, subquadrate and convex in front, slightly wider than pronotum and feebly concave between the antennal tubercles, which are rather short and widely separated. Eyes divided (lobes connected by a narrow black band without facets), and widely separated on top. Antennæ slender, 12-jointed, considerably longer than body, and ciliate on underside with long slender hairs; first joint moderately long, not cicatricose at apex, feebly arcuate, subcylindrical; third joint subequal in length to first joint. Pronotum subcylindrical, sides and disk unarmed but with distinct transverse grooves. Elytra elongate, unarmed at base, and clothed with moderately long erect fine hairs (the hairs not stiff and bristling as in *Ebaeides*). Legs moderately long; femora strongly clavate and unarmed at tips; anterior tibiæ arcuate; middle and posterior pairs straight and not emarginate on outer margin near apex; tarsi rather short, narrow, fourth joint subequal in length to joints 1 to 3 united; tarsal claws divergent.

Genotype, *Callienispia elegans* sp. nov.

This genus belongs to the tribe Niphonini and is very closely allied to *Enispia* Pascoe, but the antennæ are longer and slenderer, 12-jointed, and the body is not armed with erect stiff hairs. In the tables given by Pascoe, this genus will run to *Nesomomus* Pascoe, but in that genus the first antennal joint is shorter and the tarsal claws are divaricate, which characters place it in the tribe Acanthocinini.

Callienispia elegans sp. nov.

Male.—Elongate, moderately robust and subopaque; above brownish black, elytra slightly paler brown and ornamented with distinct yellowish white pubescent designs; beneath dark brown, the median parts more yellowish.

Head with an obsolete longitudinal carina extending from occiput to epistoma (the carina more or less depressed on vertex) and strongly convex in front; surface sparsely, finely, and irregularly punctate, rather densely clothed with short recumbent cinereous pubescence, with a few long erect fine hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes small, the lower lobes rounded and strongly convex, the upper lobes very narrow and separated from each other on the top by a little less than half the distance that separates the lower lobes on the front. Antennæ twice as long as body, uniformly dark brown, sparsely clothed with short brownish pubescence, except at base of joints 3 to 6 where it is cinereous, and rather densely ciliate on underside with moderately long erect fine hairs; first joint extending to middle of pronotum; third joint subequal in length to first and fourth joints, the following joints slightly shorter and nearly subequal in length. Pronotum quadrate, base and apex about equal in width; sides arcuately rounded at middle and feebly constricted near anterior and posterior angles; surface moderately convex, rather deeply transversely grooved at apical and basal thirds, with a few coarse, widely separated punctures, sparsely clothed with inconspicuous pubescence, except on the median part where it is longer and more conspicuous, and with a few long erect fine hairs intermixed. Scutellum rather large, broadly rounded posteriorly, and densely clothed with cinereous pubescence. Elytra slightly wider than pronotum and feebly depressed on basal half; sides parallel to apical third, then arcuately attenuate to the tips which are separately narrowly rounded; surface with rows of regularly placed coarse punctures, which are somewhat confused in scutellar region, but become more obsolete toward apex, densely clothed with short recumbent brown pubescence, each elytron ornamented with yellowish white pubescence as follows: A narrow undulating transverse fascia near base, slightly wider at lateral margin, and bent obliquely backward at suture; a very irregular narrow fascia near basal third, forming the letter M at middle of elytra; a narrow undulating fascia just behind middle, broadly expanded at lateral margin, and bent obliquely forward to suture near base of the letter M; and apical fourth covered with vermiculate markings, which extend slightly forward along suture. Beneath densely obsoletely punctate and rather densely clothed with moderately long inconspicuous pubescence, with a few long erect hairs on the legs; last abdominal segment broadly rounded at apex.

Length, 4.5 millimeters; width, 1.5.

Type locality.—Iligan, Mindanao, Philippines.

Type in United States National Museum.

Described from a single male collected at the type locality.

Callienispia minuta sp. nov.

Female.—Elongate, moderately robust and subopaque; head and pronotum brownish black; elytra dark brown, more or less yellowish on disk at basal half, and ornamented with distinct silvery white pubescent designs; beneath reddish brown, the median parts yellowish.

Head without longitudinal carina, strongly convex in front and nearly flat between the antennal tubercles; surface sparsely, coarsely punctate, rather densely clothed with moderately long semierect cinereous pubescence, and with long erect fine hairs intermixed; mandibles reddish brown; palpi brownish yellow; eyes rather small, the lower lobes rounded and strongly convex, the upper lobes very narrow and separated from each other on the top by a little less than half the distance that separates the lower lobes on the front. Antennæ nearly twice as long as body, uniformly dark brown, sparsely clothed with short brown pubescence, except the base of the intermediate joints where it is cinereous, and with numerous erect fine hairs which are longer on underside of joints; first joint extending to middle of pronotum; third joint subequal in length to first and fourth joints; the following joints only feebly shorter and nearly subequal in length. Pronotum slightly wider than long, base and apex about equal in width; sides feebly rounded at middle and feebly constricted near anterior and posterior angles; surface moderately convex, rather deeply transversely grooved at basal and apical thirds, with a few coarse, widely separated punctures, sparsely clothed with short inconspicuous pubescence, with a longitudinal median line, and a small spot on each side along anterior margin, of longer silvery white hairs, and with a few long, very fine, erect hairs intermixed. Scutellum somewhat triangular and densely clothed with silvery white pubescence. Elytra slightly wider than pronotum and feebly depressed on basal half; sides parallel to middle, feebly arcuately expanded behind middle, then arcuately attenuate to the tips which are separately narrowly rounded; surface with rows of widely separated punctures, which are coarse on the basal region but become more obsolete toward apex, densely clothed with short brown pubescence, and ornated with silvery white pubescence as follows: A heart-shaped ring on middle of elytra at basal third, connected on each side with a narrow fascia extending obliquely forward to humeri; the ring is also connected on each side posteriorly to a U-shaped mark, with the opening toward base; a narrow fascia extending from the lateral margins obliquely forward to near suture at middle, then bent obliquely backward to suture; and a rounded, vermiculate spot at suture near apex. Beneath densely, obsoletely punctate, rather densely clothed with moderately long recumbent cinereous pubescence, with a few long erect hairs on the legs; last abdominal segment broadly but not deeply depressed at apex.

Length, 4 millimeters; width, 1.3.

Type locality.—Singapore, Straits Settlements.

Type in United States National Museum.

Described from a single female collected at the type locality (*Baker 13505*).

Genus **PLATYZEARGYRA** novum

Head not retractile, transverse, convex in front, slightly wider than pronotum, and flat between the antennal tubercles which are feebly developed and widely separated. Eyes divided (lobes connected by a narrow black band without facets) and widely separated on the top. Antennæ rather slender, 11-jointed, considerably longer than body, and ciliate on underside with long slender hairs; first joint moderately long, not cicatricose at apex, feebly arcuate, and cylindrical; third joint shorter than first joint. Pronotum subcylindrical, sides and disk unarmed but with more or less distinct transverse grooves. Elytra elongate, unarmed at base, and clothed with moderately long erect fine hairs (the hairs not stiff and bristling as in *Ebaeides*). Legs moderately long; femora strongly clavate and unarmed at tips; anterior tibiæ feebly arcuate; middle and posterior tibiæ straight and not emarginate on outer margin near apex; tarsi rather short, narrow, fourth joint about equal in length to joints 1 to 3 united; tarsal claws divergent.

Genotype, *Platyzeargyra bakeri* sp. nov.

This genus belongs to the tribe Niphonini. It is more or less allied to *Egesina* Pascoe, but the antennæ are long and slender, and the body is not clothed with long bristling hairs as in that genus. Superficially it resembles a flattened *Zeargyra* Pascoe without the thoracic and elytral spines.

Platyzeargyra bakeri sp. nov.

Male.—Elongate, rather robust, and feebly shining; above uniformly black, elytra ornamented with distinct cinereous pubescent designs; beneath brownish black and more or less tinged with yellow.

Head with a narrow longitudinal groove, which is more or less obsolete on front, and elevated into a carina near epistoma, strongly transverse and convex in front; surface coarsely and rather densely punctate, rather densely clothed with short semierect cinereous pubescence, and with numerous long erect fine hairs intermixed; mandibles black; palpi luteous; eyes rather small, the lower lobes rounded and strongly convex, the upper lobes very narrow and separated from each other on the top by half the distance that separates the lower lobes on front. Antennæ about one and one-fourth times as long as body, uniformly brownish black, rather densely clothed with short recumbent pubescence, and rather densely ciliate on underside with long erect brownish hairs; first joint extending to about middle of pronotum, and moderately robust; third joint slightly shorter than first joint, and a little longer than fourth, the following joints gradually diminishing in length. Pronotum quadrate, distinctly narrower at base than apex; sides feebly arcuately rounded to basal fourth where they are slightly constricted; surface moderately convex, broadly transversely depressed along anterior and posterior margins, coarsely, densely, and regularly punctate, sparsely clothed with moderately long recumbent cinereous pubescence, and with numerous long inconspicuous erect hairs intermixed. Scutellum rather large and broadly rounded posteriorly. Elytra about as wide as pronotum in front, and feebly depressed on basal half; sides parallel to apical fourth, then arcuately attenuate to the tips which are separately narrowly rounded; surface with rows of widely separated punctures which are coarse at base but become more obsolete toward apex, rather densely clothed with moderately long recumbent cinereous pubescence, except on apical fourth where the pubescence is brownish, and in the following black areas: A narrow V-shaped space behind scutellum extending from humeri to suture at basal fourth; an irregular space behind the humeral angles, with a narrow obsolete line extending obliquely backward to middle of disk; and a transverse fascia at middle, which is expanded obliquely backward and forward along the lateral margins, and also more feebly backward and forward along suture; the cinereous pubescent areas are narrowly margined anteriorly with more silvery white pubescence, and there are also numerous long inconspicuous erect hairs over the entire surface. Beneath densely, obsoletely punctate, and rather densely clothed with moderately long recumbent cinereous pubescence, with a few longer hairs on the legs; last abdominal segment broadly rounded at apex.

Length, 4.5 millimeters; width, 1.5.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single male collected at the type locality.

Genus **NEOEGESINA** novum

Head not retractile, transversely oval and feebly convex in front, distinctly wider than pronotum, flat between the antennal tubercles which are short and widely separated, and the sides more or less acutely angulated. Eyes divided (lobes connected by a narrow black band without facets) and widely separated on the top. Antennæ robust, 11-jointed, longer than body, and clothed with long slender erect hairs; first joint moderately long, not cicatricose at apex, feebly arcuate, and subclavate; third joint subequal or slightly shorter than first joint. Pronotum transverse, narrower at base than apex, sides and disk unarmed, but with distinct transverse grooves along base. Elytra elongate, unarmed at base, and clothed with moderately long erect hairs (the hairs not as stiff and bristling as in *Ebaeides*). Legs moderately long; femora strongly clavate, somewhat flattened, and unarmed at tips; anterior tibiæ strongly arcuate; middle and posterior tibiæ straight, not emarginate on outer margin near apex; tarsi short, narrow, fourth joint about equal in length to joints 1 to 3 united; tarsal claws divergent.

Genotype, *Neoegesina ornata* sp. nov.

This genus belongs to the tribe Niphonini, and is closely allied to *Egesina* Pascoe, but differs from it in having the head distinctly wider than pronotum, the pronotum distinctly transverse, much narrower at base than apex, and distinctly transversely grooved near base.

Neoegesina ornata sp. nov.

Male.—Above brownish black, with basal third of elytra and anterior margin of pronotum reddish brown, and ornamented with cinereous pubescence; beneath brownish black, with the median parts more or less reddish.

Head acutely angulated on each side, with a narrow longitudinal groove extending from occiput to a broad, elevated tooth at epistoma; surface finely and rather densely punctate, sparsely clothed with short recumbent cinereous pubescence, and with a few long fine erect hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes small, the lower lobes elongate, narrow, and acutely convex, the upper lobes narrow and separated from each other on the top by nearly one-third the distance that separates the lower lobes on the front. Antennæ slightly longer than body, uniformly dark brown, sparsely clothed with short brown pubescence, with numerous long erect hairs intermixed, and the intermediate joints narrowly annulated with cinereous pubescence at base; first joint extending to middle of pronotum; third joint subequal in length to first joint, and slightly longer than fourth, the following joints gradually diminishing in length. Pronotum strongly transverse, and distinctly narrower at base than apex; sides arcuately rounded anteriorly, then obliquely attenuate to near posterior angles where they are parallel; surface moderately convex, with two narrow, deeply impressed transverse grooves near base, sparsely, rather coarsely and irregularly punctate, sparsely clothed with short inconspicuous pubescence, and ornated on each side near lateral margin with a rather broad oblique vitta of cinereous pubescence. Scutellum rather large and triangular. Elytra about as wide as pronotum at apex and feebly depressed on basal half; sides parallel to apical third, then arcuately attenuate to the tips which are separately narrowly rounded; surface densely and irregularly punctate, the punctures coarse on basal half but becoming obsolete toward apex, rather densely clothed with short brown inconspicuous pubescence, with numerous fine long erect hairs intermixed, each elytron ornamented with more or less distinct cinereous pubescent markings as follows: The basal half more or less irregularly variegated and a more distinct arcuate spot just behind the middle, extending narrowly backward along suture, and strongly expanded at apex. Beneath finely, densely punctate, and sparsely clothed with moderately long recumbent cinereous pubescence, with a few long erect hairs on the legs; last abdominal segment broadly rounded at apex.

Female.—Differs from the male in having the last abdominal segment broadly but very feebly depressed near apex, which is feebly arcuately emarginate.

Length, 4.7 to 5.5 millimeters; width, 1.5 to 1.75.

Type locality—Sandakan, Borneo.

Other locality.—Singapore, Straits Settlements.

Type, allotype, and paratype in United States National Museum; paratypes in the collection of C. F. Baker.

Described from eight specimens, four males and four females. The type, allotype, and one male and two female paratypes collected at the type locality (*Baker 13507*), and two male and one female paratypes from Singapore, all of which were collected by C. F. Baker. There seems to be no distinct difference between the specimens collected at Singapore and those collected at Sandakan, and there is very little variation among the specimens examined, except in size and that one of the paratypes is more reddish brown, and in some of the other paratypes the elytral markings are not quite as distinct as in the type.

This species resembles in some respects *Egesina rigida*, described by Pascoe from Singapore, but the pronotum is distinctly wider than long, the surface is ornamented with two cinereous pubescent vittæ, and the sides are strongly narrowed posteriorly.

Neoegesina varia sp. nov.

Male.—Head black; pronotum and elytra dark brown, the latter ornamented with cinereous pubescence; beneath yellowish brown.

Head not as acutely angulated on sides as in *ornata* sp. nov., with a narrow longitudinal groove extending from occiput to epistoma, but not terminating in a distinct tooth; surface rather densely finely punctate, rather densely clothed with short recumbent cinereous pubescence, with a few long fine erect hairs intermixed; mandibles yellowish brown, the tips black; palpi brownish yellow; eyes small, the lower lobes longer than wide and strongly convex, the upper lobes very small and separated from each other on the top by about half the distance that separates the lower lobes on the front. Antennæ nearly one and one-half times as long as body, uniformly reddish brown, rather densely clothed with short recumbent pubescence, with numerous long erect hairs intermixed; first joint extending to middle of pronotum; third joint slightly shorter than first joint and a little longer than fourth, the following joints gradually diminishing in length. Pronotum strongly transverse and distinctly narrower at base than apex; sides obliquely attenuate from anterior angles to near base where they are strongly constricted; surface moderately convex, with two narrow, deeply impressed transverse grooves along base, coarsely, densely and irregularly punctate, and sparsely clothed with short inconspicuous pubescence. Scutellum transverse and broadly rounded posteriorly. Elytra as wide as pronotum at apex and moderately convex; sides parallel to apical third, then arcuately attenuate to the tips which are separately narrowly rounded; surface densely and irregularly punctate, the punctures coarse on basal half but becoming obsolete toward apex, and nearly concealed by the dense yellowish white pubescence which covers the entire surface except for a narrow space along base, a broad transverse fascia at middle, and a narrow arcuate fascia extending from behind the humeri obliquely backward to the transverse median fascia at suture; in these brown areas the surface is clothed with short brown inconspicuous pubescence, and over the entire surface are numerous fine long erect hairs. Beneath finely densely punctate, and rather densely clothed with moderately long recumbent pubescence, with numerous long erect hairs on the legs; last abdominal segment subtruncate at apex.

Length, 4.8 millimeters; width, 1.5.

Type locality.—Sandakan, Borneo.

Type and allotype in United States National Museum.

Described from two specimens, male and female, collected at the type locality (*Baker 13504*). The female differs from the type only in being uniformly black above, darker beneath, and the last abdominal segment broadly but very feebly depressed near apex which is subtruncate.

Neoegesina fusca sp. nov.

Female.—Above uniformly brownish black, the pronotum and elytra ornamented with narrow cinereous pubescent markings; beneath yellowish brown.

Head acutely angulated on each side, with a narrow longitudinal groove extending from occiput to vertex, becoming obsolete on front, and without a distinct tooth at epistoma; surface finely and rather densely punctate, rather densely clothed with short recumbent cinereous pubescence, and with a few long fine erect hairs intermixed; mandibles yellowish brown, the tips black; palpi brownish yellow; eyes small, the lower lobes elongate, narrow, and acutely convex, the upper lobes very small and separated from each other on the top by less than half the distance that separates the lower lobes on the front. Antennæ slightly longer than body, yellowish brown, rather densely clothed with short brown pubescence, with numerous long erect hairs intermixed, the intermediate joints narrowly annulated with cinereous hairs at base; first joint extending to near base of pronotum; third joint distinctly shorter than first and slightly longer than fourth, the following joints gradually diminishing in length. Pronotum strongly transverse and slightly narrower at base than apex; sides arcuately rounded anteriorly, more obliquely attenuate to near base, where they are feebly constricted and parallel; surface moderately convex, with two narrow, deeply impressed, transverse grooves near base, sparsely, coarsely, and irregularly punctate, sparsely clothed with short inconspicuous pubescence, and ornamented on each side near lateral margins with a broad vitta of cinereous pubescence. Scutellum transverse and broadly rounded posteriorly. Elytra as wide as pronotum at apex, and feebly depressed on basal half; sides parallel to apical third, then arcuately attenuate to the tips which are separately narrowly rounded; surface rather densely punctate, the punctures more or less arranged in rows, coarse on the basal region but becoming more obsolete toward apex, rather densely clothed with recumbent brown pubescence, with numerous long erect hairs intermixed, each elytron ornamented with cinereous pubescent markings as follows: A narrow fascia near basal third, extending transversely from lateral margin to disk, then bent arcuately forward to suture, where it is connected to a narrow fascia extending obliquely forward to the humeral angle; and a narrow, somewhat sinuate transverse fascia at apical third, which extends backward along suture and is slightly bent inward near apex. Beneath finely densely punctate, and rather densely clothed with moderately long recumbent pubescence, with a few long erect hairs on the legs; last abdominal segment broadly but very feebly depressed near apex, which is feebly arcuately emarginate.

Length, 5.5 millimeters; width, 2.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality.

Neoegesina albomaculata sp. nov.

Female.—Head reddish brown; pronotum and elytra light brown, with a strong yellowish tinge, and ornamented with narrow yellowish white pubescent markings; beneath brownish yellow.

Head not as acutely angulated on sides as in *ornata* sp. nov., with a narrow longitudinal groove extending from occiput to vertex, becoming obsolete on front, and without a distinct tooth at epistoma; surface rather coarsely densely punctate, rather densely clothed with short recumbent yellowish white pubescence, and with numerous long fine erect hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes small, the lower lobes longer than wide and strongly convex, the upper lobes very small and separated from each other on the top by half the distance that separates the lower lobes on the front. Antennæ slightly longer than body, yellowish brown, rather densely clothed with short brown pubescence, with numerous long erect hairs intermixed, and the intermediate joints obsoletely annulated with cinereous pubescence at base; first joint extending slightly beyond middle of pronotum; third joint slightly shorter than first and a little longer than fourth, the following joints gradually diminishing in length. Pronotum slightly transverse and distinctly narrower at base than apex; sides obliquely attenuate from anterior angles to near base, where they are strongly constricted; surface moderately convex, with two narrow, deeply impressed, transverse grooves near base, rather densely, coarsely, and irregularly punctate, sparsely clothed with short inconspicuous pubescence, and ornated with a narrow median fascia and a small spot on each side near anterior margin, composed of yellowish white pubescence. Scutellum somewhat triangular and densely pubescent. Elytra as wide as pronotum at apex, and feebly depressed on basal half; sides parallel to apical third, then arcuately attenuate to the tips, which are separately narrowly rounded; surface rather densely punctate, the punctures coarse on basal half and more or less arranged in rows but becoming obsolete toward apex, rather densely clothed with short brown pubescence, with numerous long erect hairs intermixed, each elytron ornamented with yellowish white pubescent markings as follows: A narrow arcuate band extending from humerus to middle of disk, then backward to lateral margin at apical third, where it is somewhat expanded; a narrow band extending obliquely backward from humeral angle to suture at basal third (to which is connected a narrow band beginning at middle of disk and extending obliquely forward to scutellum), then extending arcuately to middle of disk where it is connected to the external arcuate band, and then continuing backward to suture at apical third; and apical third is more or less irregularly variegated along suture. Beneath finely densely punctate and rather densely clothed with moderately long recumbent pubescence, with a few long erect hairs on the legs; last abdominal segment broadly but very feebly depressed near apex, which is subtruncate.

Length, 5.5 millimeters; width, 2.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality.

Genus **MIMOGYARITUS** novum

Form of *Gyaritus*. Head not retractile, transverse, convex in front, slightly wider than pronotum, and deeply concave between the antennal tubercles, which are rather strongly developed and widely separated. Eyes nearly divided and rather widely separated on the top. Antennæ robust, 11-jointed, about as long as body, and clothed on underside with long erect hairs; first joint short, not cicatricose at apex, ovate, and extending only a little beyond anterior margin of pronotum; third joint equal in length to first joint. Pronotum subcylindrical, armed at sides with a distinct tooth, disk unarmed but with transverse grooves. Elytra armed with two large spines at base and clothed with long erect stiff hairs. Legs moderately long; femora rather strongly clavate and unarmed at tips; anterior tibiæ slightly arcuate; middle and posterior pairs straight and deeply emarginate on outer margin near apex; tarsi rather short, narrow, fourth joint about equal in length to joints 1 to 3 united; tarsal claws divaricate.

Genotype, *Mimogyaritus fasciatus* sp. nov.

This genus belongs to the tribe Acanthocinini, and superficially resembles the genus *Gyaritus* erected by Pascoe for three species from Sarawak, Borneo. It can, however, be easily distinguished from that genus by the claws being divaricate and the pronotum having a large convex gibbosity on the disk, whereas in *Gyaritus* the claws are divergent and the disk of pronotum is armed with two long acute spines.

Mimogyaritus fasciatus sp. nov.

Male.—Moderately robust and subopaque; above black, elytra narrowly reddish yellow at base, each elytron ornamented with a narrow transverse angulated velvety black fascia just behind middle; beneath brownish black, the legs slightly reddish.

Head with a narrow longitudinal groove extending from occiput to epistoma, rather strongly convex in front, and the surface nearly smooth, very sparsely clothed with inconspicuous pubescence, and with a few widely separated granules, from which arises a long erect black hair; mandibles black; palpi dark brown; eyes moderately large, the lower lobes longer than wide and strongly convex, the upper lobes narrow and separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ brownish black, except the first joint which is reddish yellow; finely rugosely punctate, sparsely clothed with short inconspicuous pubescence, and with long erect black hairs on underside of joints; first joint slightly longer than wide, very robust, and ovate; third joint equal in length to first and three-fourths as long as fourth, the following joints gradually diminishing in length. Pronotum quadrate, apex and base equal in width; sides parallel, feebly constricted near anterior and posterior angles, and armed on each side with a long, broad tooth placed slightly behind the middle, the tooth acute at tip and bent upward; surface transversely obsoletely grooved at apical and basal thirds, with a large regularly convex gibbosity on disk, and on each side between it and the lateral tooth the surface is longitudinally rugose, sparsely clothed with inconspicuous pubescence, and with numerous large granules, from each of which arises a long erect black hair. Scutellum small and broadly rounded behind. Elytra distinctly wider than pronotum and obsoletely depressed on basal half; sides parallel to apical third, then arcuately attenuate to tips, which are separately narrowly rounded; each elytron armed near base with a rather large broad tooth, placed parallel to suture, the tip bent backward, and armed on the top with a tuft of long black hairs and ornamented with a narrow transverse angulated fascia of velvety black pubescence, apex of angle closer to suture than lateral margin and extending forward; surface with a narrow carina extending from a small tubercle on each side of scutellum to apex, and parallel with suture, with a few granules in the humeral region, densely clothed with very short recumbent cinereous pubescence and with numerous long erect hairs intermixed. Beneath finely densely punctate, rather densely clothed with short recumbent cinereous pubescence, and with a few longer hairs on the legs; first abdominal segment about as long as the following segments united; last segment broadly rounded at apex.

Length, 5 millimeters; width, 1.75.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single male collected at the type locality.

Genus **ZEARGYRODES** novum

Form of *Zeargyra.* Head retractile, broad transverse, moderately convex in front, not wider than pronotum, and flat between the antennal tubercles, which are short and widely separated. Eyes nearly divided, widely separated on the top, the lower lobes as wide as long. Antennæ robust, 11-jointed, about as long as body, clothed with long moderately stiff hairs; scape rather long, not cicatricose at apex, subclavate, feebly arcuate, and not extending to base of pronotum; third joint about half as long as first, the following joints gradually diminishing in length. Pronotum nearly quadrate, subcylindrical, unarmed at sides and on disk, and without transverse grooves. Elytra moderately elongate, unarmed at base, flattened on basal half, strongly convex posteriorly, and clothed with erect stiff hairs. Legs moderately long; femora moderately clavate and unarmed at tips; tibiæ nearly straight, the middle pair emarginate on outer margin near apex; tarsi short, narrow, fourth joint about equal in length to joints 1 to 3 united; tarsal claws divergent.

Genotype, *Zeargyrodes fasciatus* sp. nov.

This genus belongs to the tribe Niphonini, and is closely allied to *Zeargyra* Pascoe and *Egesina* Pascoe. From the former it differs by the absence of the tubercles on pronotum and base of elytra, and by the eyes not being entirely divided; from *Egesina* it can be separated by the pronotum not being constricted at base, and the lower lobe of the eyes not longer than wide.

Zeargyrodes fasciatus sp. nov.

Female.—Moderately robust, shining black, elytra with apical half and a broad transverse fascia at basal third clothed with short cinereous pubescence; beneath brownish black.

Head densely, coarsely, and deeply punctate, rather densely clothed with very short cinereous pubescence, and with numerous long stiff erect black hairs intermixed; mandibles and palpi reddish brown. Antennæ uniformly black, densely finely punctate, sparsely clothed with short recumbent whitish pubescence, and densely clothed with short stiff erect hairs and longer flying hairs intermixed. Pronotum nearly quadrate, slightly narrower at base than apex, strongly convex and obsoletely gibbose on disk at middle, sides feebly arcuately rounded; anterior margin slightly arcuately rounded; base transversely truncate; surface densely, coarsely, and deeply punctate, sparsely obsoletely clothed with short recumbent cinereous pubescence, with a few long erect black hairs intermixed. Scutellum broadly rounded behind. Elytra much wider than pronotum at base; humeral angles prominent and broadly rounded; sides parallel to middle, feebly expanded and arcuately rounded behind middle, then arcuately attenuate to tips, which are conjointly broadly rounded; surface with rows of coarse punctures on basal half, becoming obsolete behind the middle, sparsely clothed with very fine obsolete blackish hairs, with numerous long stiff erect hairs intermixed, each elytron with apical half and a broad transverse fascia (which is broader at suture than lateral margin) rather densely clothed with very short recumbent cinereous pubescence; along anterior margin of the transverse fascia is a narrow row of longer and denser cinereous hairs, in front of which is a similar sinuate arcuate row extending from near suture to lateral margin, with the apex toward humerus, and a similar strongly sinuate transverse line in the dark median area, extending from lateral margin to middle of disk. Beneath finely densely punctate, and densely clothed with very fine cinereous pubescence, the hairs becoming longer and more conspicuous along posterior margin of first segment; last segment feebly depressed near apex and the surface with an obsolete longitudinal median line; middle and posterior tibiæ feebly curved outward at apex.

Length, 4.5 millimeters; width, 1.6.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a unique female collected at the type locality. In form and color this species resembles *Zeargyra vidua* Pascoe very closely, but can be easily separated from that species by the generic characters.

Ebaeides borneensis sp. nov.

Male.—Head reddish brown; pronotum and elytra light chestnut brown, the former slightly paler along base and anterior margin, and the upper surface of elytra irregularly marked with cinereous pubescence; beneath brownish black, becoming more or less luteous in many parts.

Head deeply concave between the antennal tubercles, the surface sparsely punctate, rather densely clothed with moderately long recumbent yellowish white pubescence, and with numerous stiff erect black hairs intermixed; mandibles reddish brown, the margins blackish; palpi yellowish brown. Antennæ 10-jointed, reddish brown, the narrow apical joints and base of swollen joints paler, the surface coarsely punctate, rugose, and densely clothed on all sides with short stiff bristling hairs and longer flying hairs intermixed; scape scarcely arcuate; third, fourth, and fifth joints very much swollen. (Joints 8 to 10 missing.) Pronotum one and one-fourth times as wide as long, base and apex about equal in width; sides feebly arcuate and feebly constricted near posterior and anterior angles; surface rather deeply, broadly, transversely grooved near base and anterior margins, finely obsoletely punctate and rather densely clothed with long recumbent yellowish brown pubescence, and with a longitudinal vitta of whitish pubescence on each side. Scutellum rounded behind. Elytra much wider than pronotum at base, with distinct rows of rather coarse, irregularly placed punctures, the surface rather densely clothed with very short recumbent brown pubescence, and ornamented with coarser and longer cinereous pubescence, irregularly placed over the basal two-thirds and extending narrowly along suture to apical fourth, where it forms a transverse arcuate fascia which does not extend to the lateral margins; there are also numerous short erect stiff black hairs, which are more distinct toward sides. Beneath finely densely punctate, and rather densely clothed with very fine cinereous hairs; anterior tibiæ strongly arcuate on inner margin, the middle and posterior pairs slightly curved outward.

Length, 4.5 millimeters; width, 1.6.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from one male received from C. F. Baker. This species is very closely allied to *E. monstrosa* Pascoe, which is the genotype, and *E. fulva* sp. nov., but differs from both of these species in having the pronotum as wide at base as at apex, and a distinct longitudinal cinereous pubescent vitta on each side of pronotum.

Ebaeides fulva sp. nov.

Female.—Head reddish brown; pronotum chestnut brown, with the base and anterior margin slightly paler; elytra luteous, with obsolete brownish markings on disk, and irregularly marked with cinereous pubescence; beneath yellowish brown, becoming luteous in some areas.

Head moderately concave between the antennal tubercles, the surface sparsely finely punctate, sparsely clothed with obsolete yellowish pubescence, and with a few stiff erect black hairs intermixed; mandibles reddish brown, the margins blackish; palpi luteous. Antennæ 10-jointed, reddish to brownish black, base of joints paler, the surface densely coarsely punctate, and rather densely clothed on all sides with short stiff bristling hairs and longer flying hairs intermixed; scape smoother and slightly arcuate; third, fourth, and fifth joints moderately swollen. Pronotum one and one-third times as wide as long and slightly narrower at base than apex; sides feebly arcuate at middle, feebly constricted near anterior angles, and parallel at base; surface broadly but not very deeply transversely grooved near base and anterior margin, obsoletely punctate, and rather sparsely clothed with obsolete brownish pubescence. Scutellum rounded behind. Elytra much wider than pronotum at base, with distinct rows of moderately coarse punctures, which are more irregularly placed toward apex, the surface sparsely clothed with very fine short brownish hairs and ornamented with coarser and longer cinereous pubescence which is more or less irregularly placed on basal third, extending narrowly along suture to apical fourth, and forming a narrow transverse zigzag fascia behind the middle and extending from suture to lateral margins, behind which is a short narrow oblique fascia on each elytron, forming a right angle at suture, with the apex toward base of elytra; there are also numerous short erect stiff black hairs, which are more distinct toward sides. Beneath sparsely finely punctate, and sparsely clothed with a few short whitish hairs; anterior tibiæ strongly arcuate on inner margin, the middle and posterior pairs nearly straight, at most only feebly curved outward at apex.

Length, 3.5 millimeters; width, 1.25.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female received from C. F. Baker. This species is also closely allied to *E. monstrosa* Pascoe and *E. borneensis* sp. nov. From the latter it differs in having the pronotum narrower at base than at apex, without longitudinal cinereous pubescent vittæ on pronotum, the markings on the elytra differently arranged, and also in being smaller. From *monstrosa* it differs in having the transverse pubescent fascia behind middle of elytra zigzag and not arcuate, and by the absence of the transverse grayish pubescence on pronotum.

Ebaeides basalis sp. nov.

Female.—Black; pronotum with the anterior and posterior margins reddish yellow; elytra with the basal regions reddish yellow and the surface more or less ornamented with cinereous pubescence; beneath brownish black and more or less reddish yellow on the median parts.

Head broadly feebly concave between the antennal tubercles, the surface sparsely obsoletely punctate, not very densely clothed with moderately long cinereous pubescence, and with a few stiff erect black hairs intermixed; mandibles black; palpi yellowish brown. Antennæ 11-jointed, uniformly black, the surface densely coarsely punctate, rugose, and densely clothed on all sides with short stiff erect hairs and longer flying hairs intermixed; scape scarcely arcuate; third, fourth, and fifth joints strongly swollen. Pronotum slightly wider than long, base and apex about equal in width; sides slightly arcuate at middle and feebly constricted near anterior and posterior angles; surface rather deeply transversely grooved near base and anterior margin, densely obsoletely punctate, and rather densely clothed with moderately long inconspicuous pubescence, forming a more or less distinct longitudinal median line, and with a more conspicuous spot of cinereous hairs on each side toward the lateral margins. Scutellum broadly rounded behind. Elytra much wider than pronotum at base, with rows of coarse, rather closely and irregularly placed punctures, the punctures becoming more obsolete toward apex, the surface sparsely clothed with fine short brownish black pubescence, and ornamented with coarser and longer cinereous hairs, forming obsolete narrow longitudinal broken rows along suture, lateral margins, and at apex, and on each elytron a longitudinal arcuate vitta extending from humerus to near the middle, with the concavity toward the lateral margin, a similar one extending from inner side of scutellum to suture at basal third, with the concavity toward suture, and with a small irregularly shaped spot on disk near apical third; there are also numerous short stiff erect black hairs over the surface, which are more conspicuous toward the sides. Beneath finely densely punctate, and rather densely clothed with moderately long cinereous hairs, with a few longer ones intermixed; anterior tibiæ strongly arcuate on the inner side, the middle and posterior pairs feebly curved outward.

Length, 4.5 millimeters; width, 1.5.

Type locality.—Cuernos Mountains, Negros, Philippines.

Type in United States National Museum.

Described from one female collected at the type locality (*Baker 21717*).

Ebaeides pilosicornis sp. nov.

Male.—Head piceous; pronotum and elytra dark brown, the former with the anterior and posterior margins luteous, the elytra more or less marked with luteous, especially on the basal region, and irregularly ornamented with cinereous pubescence; beneath brown, the median parts, tibiæ, and tarsi more or less luteous.

Head deeply and broadly concave between the antennal tubercles; the surface sparsely obsoletely punctate, densely clothed with rather long whitish pubescence, and with a few stiff erect black hairs intermixed; mandibles reddish brown, margins black; palpi luteous. Antennæ 11-jointed, reddish black, base of joints more reddish, the surface coarsely densely punctate, somewhat rugose, and rather densely clothed on all sides with short stiff bristling hairs and longer flying hairs intermixed; scape feebly arcuate; third, fourth, and fifth joints moderately swollen. Pronotum as long as wide, slightly narrower at base than apex; sides slightly arcuate at middle and feebly constricted near anterior and posterior angles; surface broadly and rather deeply transversely grooved near base and anterior margin, finely obsoletely punctate, and rather densely clothed with moderately long recumbent brownish or yellowish white pubescence. Scutellum broadly rounded behind. Elytra much wider than pronotum at base, with rows of coarse, irregularly placed punctures, the surface sparsely clothed with very fine short brownish pubescence, and ornamented with coarser and longer cinereous hairs, which are more or less irregularly placed, forming on each elytron a longitudinal arcuate vitta extending from humerus backward to near middle, with the concavity toward the lateral margin, a similar one extending from inner side of scutellum to basal third, with the concavity toward suture, then forming a semicircular spot along suture at middle, a small irregularly shaped transverse spot at apical third, placed closer to suture than lateral margin, and with numerous obsolete rows of cinereous hairs on apical half; there are also numerous short erect black hairs over the surface, which are more distinct toward the sides. Beneath rather densely obsoletely punctate, and rather densely clothed with moderately long cinereous hairs, especially on the legs; anterior tibiæ strongly arcuate on inner side, the middle and posterior pairs slightly curved outward.

Length, 4.5 millimeters; width, 1.6.

Type locality.—Sibuyan Island, Philippines.

Type in United States National Museum.

Described from one male collected at the type locality. This species is closely allied to *E. palliata* and *E. viduata*, both described by Pascoe from Borneo. From both these species it differs in having joints 5 to 11 of the antennæ paler at base, and from *palliata* also by the pronotum being deeply transversely grooved near base and anterior margin.

Ebaeides albopicta sp. nov.

Female.—Brownish black, the basal regions of the elytra reddish, and ornamented with cinereous pubescence; beneath brownish black, with the median parts reddish yellow.

Head broadly but not very deeply concave between the antennal tubercles, the surface sparsely obsoletely punctate, sparsely clothed with moderately long cinereous pubescence, and with a few stiff erect black hairs intermixed; mandibles reddish brown, becoming black at tips; palpi yellowish brown. Antennæ 11-jointed (eleventh joint missing), uniformly black, the surface coarsely densely punctate, rugose, and densely clothed on all sides with short stiff erect hairs and longer flying hairs intermixed; scape feebly arcuate; third, fourth, and fifth joints moderately swollen. Pronotum slightly wider than long, base and apex about equal in width; sides slightly arcuate at middle and feebly constricted near anterior and posterior angles; surface rather deeply transversely grooved near base and anterior margin, finely densely punctate, and rather densely clothed with fine brownish pubescence and ornamented with a few more or less distinct spots of cinereous hairs. Scutellum broadly rounded behind. Elytra much wider than pronotum at base, with rows of coarse, irregularly placed punctures, the punctures becoming more obsolete toward apex, the surface sparsely clothed with fine short brownish black pubescence and ornamented with coarser and longer cinereous hairs, forming narrow longitudinal broken rows, and on each elytron a broad elongate obsolete spot at base, a smaller one on disk in front of middle, and a more irregular spot behind middle; there are also numerous long stiff erect black hairs over the surface, which are more conspicuous toward sides. Beneath finely, densely punctate, and rather densely clothed with fine, moderately long cinereous hairs and with a few longer erect ones intermixed, especially on the legs; anterior tibiæ feebly arcuate on inner side, the middle and posterior pairs nearly straight.

Length, 4 millimeters; width, 1.5.

Type locality.—Basilan Island, Philippines.

Type in United States National Museum.

Described from a unique female collected at the type locality.

Ebaeides hirsuta sp. nov.

Female.—Black, the basal regions of elytra slightly reddish, and ornamented with yellowish white pubescence; beneath black, with a feeble reddish tinge on the median parts.

Head deeply and broadly concave between the antennal tubercles, the surface sparsely, obsoletely punctate, densely clothed with long recumbent yellowish white pubescence, and with numerous stiff erect black hairs intermixed; mandibles black; palpi reddish brown. Antennæ 11-jointed, uniformly black, the surface densely coarsely punctate, rugose, and rather densely clothed on all sides with short stiff erect hairs and longer flying hairs intermixed; scape arcuate; third, fourth, and fifth joints strongly swollen. Pronotum one and three-tenths times as wide as long, base and apex nearly equal in width; sides slightly arcuate at middle and feebly constricted near anterior and posterior angles; surface rather deeply transversely grooved near base and anterior margin, finely densely punctate, sparsely clothed with fine, inconspicuous pubescence, forming a more distinct longitudinal median line, and with two spots of more conspicuous yellowish hairs on each side toward lateral margins. Scutellum broadly rounded behind. Elytra much wider than pronotum at base, with rows of coarse, irregularly placed punctures, the punctures becoming more obsolete toward apex, the surface sparsely clothed with fine short brownish black pubescence and ornamented with coarser and longer yellowish white hairs, forming narrow longitudinal broken rows, and on each elytron a more distinct vitta, extending arcuately from inner side of scutellum to suture at basal fourth, a small spot on middle of disk at basal third, and a larger, more irregularly shaped spot just behind middle; there are also numerous long stiff erect black hairs over the surface, which are more conspicuous toward sides. Beneath finely densely punctate, and densely clothed with very fine, moderately long cinereous hairs and with a few longer erect ones intermixed; anterior tibiæ strongly arcuate on inner side, the middle and posterior pairs feebly curved outward.

Length, 5.5 millimeters; width, 1.9.

Type locality.—Iligan, Mindanao, Philippines.

Type in United States National Museum.

Described from one female collected at the type locality (*Baker 21714*). This species is very closely related to *E. basalis* sp. nov. and *E. albopicta* sp. nov., and all are probably only geographical races of one old species, which have been separated for a great length of time and developed into distinct types or species. More material is necessary for the study of these closely allied forms.

Ebaeides montana sp. nov.

Male.—Above black, the elytra ornamented with narrow longitudinal rows of cinereous pubescence and sometimes reddish at base; beneath black, becoming somewhat reddish on sternum and tibiæ.

Head rather deeply concave between the antennal tubercles, the surface sparsely punctate, rather densely clothed with moderately long cinereous pubescence, and with numerous stiff erect black hairs intermixed; mandibles reddish brown, the margins black; palpi luteous. Antennæ 10-jointed, black, sometimes the joints paler at base, the surface densely coarsely punctate, rugose, and densely clothed on all sides with short stiff bristling hairs and longer flying hairs intermixed; scape slightly arcuate; third, fourth, and fifth joints moderately swollen. Pronotum nearly as long as wide, base and apex about equal in width; sides feebly arcuate at middle, and not distinctly constricted near posterior and anterior angles; surface feebly broadly transversely grooved near base and anterior margin, finely sparsely punctate, and sparsely clothed with obsolete recumbent brownish pubescence. Scutellum rounded behind. Elytra much wider than pronotum at base, with distinct rows of coarse, densely and irregularly placed punctures, sparsely clothed with short obsolete brownish pubescence and numerous short erect stiff black hairs intermixed, and each elytron with about ten narrow longitudinal rows of cinereous hairs, which become more or less confused toward apex. Beneath finely and densely punctate except on the median parts, rather densely clothed with short recumbent cinereous pubescence, especially on the legs, and with a few obsolete erect hairs intermixed; femora strongly swollen; anterior tibiæ strongly arcuate on inner side, the middle and posterior pairs slightly curved outward.

Female.—Similar to the male, differing from it only in the secondary sexual characters, such as the last abdominal segment with a concave depression near apex, and the absence of the depressed oblong spot on the femora.

Length, 4.25 to 4.75 millimeters; width, 1.4 to 1.7.

Type locality.—Cuernos Mountains, Negros, Philippines.

Type, allotype, and paratype in United States National Museum; paratypes in the collection of C. F. Baker.

This species was described from five specimens, three males and two females, all collected at the type locality. It can be separated easily from all the other known species having a 10-jointed antenna by the distinct narrow, longitudinal rows of cinereous pubescence on the elytra.

Ropica variegata sp. nov.

Female.—Elongate, rather robust, and strongly convex; above chestnut brown, irregularly variegated with a luteous color; beneath yellowish brown.

Head nearly quadrate and feebly convex in front, not wider than pronotum, feebly concave between the antennal tubercles, which are short and widely separated; surface with a narrow longitudinal carina extending from occiput to near epistoma, rather densely coarsely punctate, and densely clothed with short recumbent yellowish pubescence; mandibles reddish brown, becoming black at tips; palpi luteous; eyes divided, the lower lobe small and rounded, the upper lobe narrow and widely separated on top. Antennæ slightly longer than body, uniformly luteous, and sparsely clothed with short recumbent brownish pubescence (hairs obsoletely yellowish white at apex of joints); first joint short, moderately robust, cylindrical, and shorter than third; third and fourth joints nearly subequal in length; the following joints gradually diminishing in length. Pronotum one and two-thirds times as wide as long, slightly narrower at base than apex, and widest at middle; sides unarmed and feebly arcuately rounded; anterior and posterior margins transversely truncate;

surface regularly convex, with a narrow groove along base and anterior margin, densely coarsely punctate, the punctures deeply impressed, distinctly separated and somewhat denser toward sides, densely clothed with short recumbent brownish and yellowish pubescence, the brownish hairs forming three obsolete longitudinal vittæ on disk. Scutellum broadly rounded behind. Elytra slightly wider than pronotum at base, the sides nearly parallel to apical third, where they are feebly arcuately expanded, then arcuately attenuate to the tips, which are separately obtusely angulated; surface obsoletely depressed on disk at basal third, densely, deeply, and irregularly punctate, the punctures coarser at base, but becoming finer and more widely separated toward apex, densely clothed with short recumbent brownish and yellowish white pubescence, the brown pubescence forming an obsolete spot behind scutellum, a transverse irregularly shaped broken fascia near middle, and becoming more variegated on the apical half. Beneath finely densely punctate and densely clothed with very fine recumbent cinereous pubescence; last abdominal segment subtruncate at apex, feebly depressed, and with a narrow longitudinal median groove; anterior and middle tibiæ nearly straight, the posterior pair feebly curved outward near apex.

Length, 4.25 millimeters; width, 1.75.

Type locality.—Basilan Island, Philippines.

Type in United States National Museum.

Described from one female collected at the type locality (*Baker 13512*). Under this species I have placed another specimen collected by Professor Baker at the same locality, which does not agree exactly with the type. It is a male and is more brownish black above, the pubescence on the elytra is more or less denuded, and the markings are not quite as distinct as in the type. It is best to place it under this species, at least for the present, until more material is available for study.

Ropica robusta sp. nov.

Male.—Elongate, rather robust, and strongly convex; above brownish black, each elytron ornamented with obsoletely paler areas as follows: A small spot at base near scutellum, a broad elongate spot in front of middle along suture, and the entire apical third; beneath brownish black, first abdominal segment reddish brown.

Head quadrate and feebly convex in front, not wider than pronotum, feebly concave between the antennal tubercles, which are short and widely separated; surface with a concave depression on vertex between eyes, an obsolete longitudinal carina on front, sparsely coarsely punctate, and rather densely clothed with short recumbent yellowish white pubescence; mandibles reddish brown, tips black; palpi brownish yellow; eyes small, divided, the lower lobe rounded, and the upper lobe narrow and widely separated on top. Antennæ slightly longer than body, uniformly brownish black, and sparsely clothed with short inconspicuous pubescence with a few cinereous hairs intermixed; first joint short, moderately robust, cylindrical, and shorter than third; third and fourth joints nearly subequal in length; the following joints gradually diminishing in length. Pronotum one and one-half times as wide as long, apex and base about equal in width and widest at middle; sides unarmed and feebly arcuately rounded; anterior and posterior margins transversely truncate; surface regularly convex, with a narrow groove along base and anterior margin, only visible at sides, densely coarsely punctate, the punctures irregularly placed and distinctly separated, and rather densely clothed with short recumbent yellowish white pubescence. Scutellum broadly rounded behind. Elytra distinctly wider than pronotum at base, the sides nearly parallel to apical third, where they are feebly arcuately expanded, then arcuately attenuated to the tips, which are separately obtusely rounded; surface convex, densely, coarsely, and irregularly punctate over entire surface, rather densely clothed with short inconspicuous pubescence, each elytron ornamented with coarser whitish pubescence as follows: A small spot at base near scutellum, a broad elongate spot along suture in front of middle, and more or less variegated at the side and on apical third. Beneath densely, finely punctate and densely clothed with fine recumbent cinereous pubescence; last abdominal segment broadly rounded at apex; anterior and middle tibiæ nearly straight, the posterior pair feebly curved outward near apex.

Length, 3.75 millimeters; width, 1.5.

Type locality.—Cuernos Mountains, Negros, Philippines.

Type in United States National Museum.

Described from a unique male collected at the type locality.

Sybra scutellata sp. nov.

Male.—Elongate, subcylindrical; head and pronotum chestnut brown, the latter with the anterior margin yellowish brown; elytra brownish yellow, with a large triangular brownish black spot covering scutellar region, a broken, irregularly shaped dark brown spot at suture near middle, and apical half more or less variegated with the same color; beneath dark brown, sternum and legs, except middle of femora, brownish yellow.

Head quadrate and feebly convex in front, not wider than pronotum, nearly flat between the antennal tubercles, which are very short and widely separated; surface very coarsely, sparsely punctate, and rather densely clothed with moderately long recumbent yellowish pubescence; mandibles reddish brown, the tips black; palpi brownish yellow; eyes rather large, coarsely granulated and deeply emarginate, the lower lobe rounded, and the upper lobes separated from each other on the top by about half the distance that separates the lower lobes on the front. Antennæ about as long as body, slender, uniformly brownish yellow, and sparsely clothed with short recumbent cinereous pubescence; first joint short, ovate, and slightly robust; third and fourth joints feebly arcuate, fourth slightly longer than third, the following joints gradually diminishing in length. Pronotum only obsoletely wider than long, apex and base about equal in width, and widest at middle; sides arcuately rounded; base transversely truncate; anterior margin arcuately rounded; surface regularly convex, with a broad shallow transverse depression along base, rather densely, coarsely punctate, and densely clothed with moderately long recumbent yellowish white pubescence. Scutellum broadly rounded behind. Elytra slightly wider than pronotum, the sides parallel to apical third, then arcuately attenuate to the tips, which are conjointly, deeply, rectangularly emarginate; surface with rows of coarse, rather closely placed punctures, which are somewhat confused in scutellar region and obsolete toward apex, and rather densely and irregularly clothed with moderately long recumbent yellowish white pubescence. Beneath finely densely punctate, and densely clothed with rather long recumbent yellowish pubescence; last abdominal segment broadly rounded at apex; tibiæ nearly straight, the middle pair strongly emarginate on outer margin near apex; prosternal process distinctly angulated on each side between the anterior coxæ.

Length, 3.5 millimeters; width, 1.2.

Type locality.—Basilan Island, Philippines.

Type in United States National Museum.

Described from a single male collected at the type locality.

Sybra punctata sp. nov.

Male.—Elongate and subcylindrical; above uniformly brownish black and rather shining; beneath dark brown, with a distinct reddish tinge, especially on the legs.

Head subquadrate and feebly convex in front, not wider than pronotum, feebly concave between the antennal tubercles, which are short and widely separated; surface coarsely sparsely punctate, and densely clothed with moderately long, recumbent, cinereous pubescence; mandibles reddish brown, the tips black; palpi luteous; eyes small and very deeply emarginate, the lower lobes rounded, the upper lobes close together on the top and separated from each other by about one-fourth the distance that separates the lower lobes on the front. Antennæ about as long as body, slender, uniformly reddish brown, and sparsely clothed with short recumbent cinereous pubescence, the hairs denser at base of joints; first joint short, ovate, and slightly robust; third and fourth joints feebly arcuate, fourth slightly longer than third; the following joints gradually diminishing in length. Pronotum as long as wide, apex and base equal in width, and widest at middle; sides arcuately rounded; base transversely truncate; anterior margin arcuately rounded; surface regularly convex, densely and very coarsely punctate, and sparsely clothed with short recumbent cinereous pubescence. Scutellum broadly rounded behind. Elytra slightly wider than pronotum, the sides parallel to apical third, then arcuately attenuate to the tips, which are conjointly arcuately emarginate, with the apex of each elytron obsoletely expanded; surface with rows of coarse, deep punctures, which are nearly confluent on basal region but become finer toward apex, and rather densely clothed with short recumbent cinereous pubescence, arranged in more or less distinct longitudinal rows between the rows of punctures. Beneath obsoletely punctate and sparsely clothed with moderately long cinereous pubescence; last abdominal segment broadly rounded at apex; tibiæ nearly straight, the middle pair strongly emarginate on outer margin near apex; prosternal process parallel between the anterior coxæ.

Length, 3 millimeters; width, 1.

Type locality.—Basilan Island, Philippines.

Type in United States National Museum.

Described from a single male collected at the type locality.

Mynonebra opaca sp. nov.

Above dark reddish brown, opaque, the elytra ornamented with cinereous pubescence; beneath dark reddish brown, base of femora, tibiæ, and tarsi slightly paler.

Head strongly transverse and feebly convex in front, slightly wider than pronotum at apex, and broadly concave between the antennal tubercles, which are rather strongly developed and widely separated; surface finely and very densely granulose and sparsely clothed with moderately long recumbent pubescence; mandibles black and slightly reddish toward base; palpi dark brown, the tips paler; eyes rather large and deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes narrow and separated from each other on the top by about one-third the distance that separates the lower lobes on the front. Antennæ one and one-half times as long as body, slender, yellowish brown, sparsely clothed with inconspicuous pubescence, and with a few longer black hairs on underside of joints; first joint extending to about middle of pronotum, rather robust, and cylindrical; third joint subequal in length to first joint and slightly shorter than fourth; fifth, sixth, and seventh joints subequal in length to third, the following joints gradually diminishing in length. Pronotum quadrate, the base only feebly narrower than apex; sides feebly arcuate to basal fourth, then parallel to posterior angles, and with a rather short broad tooth placed slightly behind middle; surface feebly convex, without transverse depressions, very densely, finely granulose, and sparsely clothed with short recumbent cinereous pubescence, which forms three more or less distinct longitudinal vittæ on disk. Scutellum large, triangular, and broadly truncate posteriorly. Elytra distinctly wider than pronotum, moderately convex, with a broad oblique depression extending from humeri to suture, and narrowly flattened along suture; sides nearly parallel to apical third, then obliquely narrowed to tips, which are separately narrowly rounded; surface coarsely irregularly punctate, the punctures rather densely placed on basal region, but becoming obsolete toward apex, sparsely clothed with very short inconspicuous brown pubescence, and more or less marbled with longer cinereous pubescence, which is more distinct in the oblique anterior depression, forming a narrow transverse arcuate fascia at apical third. Beneath finely densely punctate and rather densely clothed with moderately long recumbent cinereous pubescence; last abdominal segment with a very deep semicircular depression at apex.

Length, 5.5 millimeters; width, 1.7.

Type locality.—Cuernos Mountains, Negros, Philippines.

Type in United States National Museum.

Described from a single example, probably a female, collected at the type locality.

Exocentrus subglaber sp. nov.

Female.—Head and pronotum black, the latter with the anterior and posterior margins reddish brown; elytra brownish yellow, with the sutural region broadly reddish black, and only clothed with stiff erect hairs; beneath brownish black, with the tibiæ and tarsi feebly reddish.

Head strongly transverse and nearly flat in front, as wide as pronotum at apex, and feebly concave between the antennal tubercles, which are rather short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, rather densely, finely granulose, the granules distinctly separated, very sparsely clothed with moderately long recumbent cinereous pubescence and with numerous long erect black hairs intermixed; mandibles black; palpi brownish black, the tips yellowish; eyes large and very deeply emarginate, the lower lobes quadrate and strongly convex, the upper lobes rather narrow and separated from each other on the top by about half the distance that separates the lower lobes on the front. Antennæ slightly longer than body, rather slender, uniformly dark brown, sparsely clothed with short inconspicuous pubescence, and with numerous long erect stiff black hairs intermixed; first joint extending to middle of pronotum, rather robust, and cylindrical; third joint about three-fourths as long as first joint and subequal in length to fourth, the following joints gradually diminishing in length. Pronotum twice as wide as long, distinctly narrower at base than apex; sides feebly arcuately rounded from anterior margin to a broad tooth placed slightly behind the middle, then strongly obliquely attenuate to base, the tooth long, acute at apex, and bent backward nearly in a line with elytra; surface feebly convex, with a narrow groove along anterior and posterior margins, densely granulose similar to that on head, very sparsely clothed with long recumbent cinereous pubescence, and with a few long erect stiff black hairs along the margins. Scutellum broadly rounded behind and densely clothed with recumbent cinereous pubescence. Elytra slightly wider than pronotum at middle, moderately convex, the sides nearly parallel to behind middle, where they are feebly arcuately expanded, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface with rows of coarse, closely placed punctures, the punctures forming a more or less confused double row for a short distance behind scutellum, also confused along lateral margins, and becoming obsolete toward apex, the surface glabrous, and only armed with numerous long erect stiff black hairs. Beneath finely densely punctate, sparsely clothed with rather short recumbent cinereous pubescence, and the legs with a few long erect stiff black hairs; last abdominal segment broadly triangularly emarginate at apex, transversely, narrowly, and deeply grooved along apical margin, and with a broad triangular depression in front of groove.

Length, 4.5 millimeters; width, 1.8.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality.

Exocentrus mindanaoensis sp. nov.

Female.—Head black, slightly reddish along anterior margin; pronotum and elytra reddish brown, the former slightly paler along anterior and posterior margins, elytra paler at apex and rather densely, irregularly ornamented with cinereous pubescence, with an obsolete brown area on each elytron behind middle; beneath reddish brown, with the femora slightly darker.

Head strongly transverse and nearly flat in front, slightly wider than pronotum at apex, nearly flat between the antennal tubercles, which are short and widely separated; surface with an obsolete longitudinal carina, rather densely finely granulose, the granules distinctly separated, rather densely clothed with moderately long recumbent yellowish white pubescence, with a few long erect black hairs intermixed; mandibles black, slightly reddish at base; palpi reddish brown, the tips paler; eyes very large and deeply emarginate, the lower lobes quadrate and strongly convex, the upper lobes small and separated from each other on the top by half the distance that separates the lower lobes on the front. Antennæ slightly longer than body (last joint missing), slender, reddish brown, the joints slightly paler at base, sparsely clothed with short recumbent cinereous pubescence and with numerous long erect black hairs intermixed; first joint extending to middle of pronotum, rather robust, and subcylindrical; third joint three-fourths as long as first joint and slightly shorter than fourth. Pronotum twice as wide as long, and slightly narrower at base than apex; sides arcuately expanded from apical angles to a moderately broad tooth placed slightly behind middle, then strongly obliquely narrowed to base, the tooth rather long, acute at apex, and bent backward nearly in a line with elytra; surface feebly convex, with a narrow obsolete transverse groove along anterior and posterior margins, densely finely punctate, with a few larger punctures intermixed, from which arises a long erect stiff black hair, and densely clothed with long recumbent yellowish white pubescence. Scutellum broadly rounded behind. Elytra slightly wider than pronotum at middle and moderately convex; sides feebly expanded at middle, arcuately attenuate posteriorly to the tips, which are separately narrowly rounded; surface with rows of coarse, closely placed punctures, the rows not extending to apex, between which are rows of rather regularly placed coarser black elevated punctures, from each of which arises a long erect stiff black hair, sparsely clothed with short brown recumbent pubescence, and ornamented with cinereous pubescence, as noted above. Beneath densely obsoletely punctate, rather densely clothed with moderately long recumbent cinereous pubescence, with numerous small round glabrous spots, and with a number of long erect black hairs intermixed; last abdominal segment triangularly emarginate at apex, narrowly grooved along apical margin, obsoletely depressed in front of groove, and with a narrow longitudinal median carina.

Male.—Similar to female, but smaller and slenderer, antennæ slightly longer, the tooth on side of pronotum bent backward more on a line with elytra, and the last abdominal segment subtruncate at apex.

Length, 4.25 to 5.75 millimeters; width, 1.75 to 2.5.

Type locality.—Davao, Mindanao.

Other localities.—Iligan and Zamboanga, Mindanao, Philippines.

Type, allotype, and paratype in United States National Museum; paratype in the collection of C. F. Baker.

Described from four specimens, the type and one female paratype from Davao, allotype from Iligan (*Baker 21710*), and one female paratype from Zamboanga (*Baker 13495*). The specimen from Zamboanga is paler than the type, the pubescence on elytra more evenly distributed, the small glabrous spots on abdomen are obsolete, and the last abdominal segment is more truncate at apex.

Exocentrus alboguttatus sp. nov.

Male.—Head black; pronotum and elytra dark brown, the former slightly reddish along the anterior and posterior margins, and the elytra with longitudinal rows of small elongate cinereous pubescent spots, these spots more confluent at the middle, forming a distinct narrow transverse fascia; beneath brownish black, becoming more reddish on the legs.

Head strongly transverse and feebly convex in front, slightly wider than pronotum at apex, slightly concave between the antennal tubercles, which are short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, and more deeply impressed between the antennæ, densely finely granulose, the granules more or less confluent, and nearly concealed by a rather long recumbent cinereous pubescence, with a few long erect black hairs intermixed; mandibles reddish brown, the margins and tips black; palpi brownish black, the tips paler; eyes very large and deeply emarginate, the lower lobes quadrate and strongly convex, the upper lobes small and separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ about one and one-fourth times as long as body, slender, uniformly dark brown, densely clothed with short recumbent brown pubescence, and base of joints annulated with cinereous hairs and with numerous long erect black hairs intermixed; first joint extending beyond middle of pronotum, robust, and cylindrical; third joint about equal in length to first joint, and distinctly longer than fourth. Pronotum not quite twice as wide as long, and distinctly narrower at base than apex; sides nearly parallel from apical angles to a slender tooth placed slightly behind middle, then strongly arcuately emarginate to base, the tooth rather long, slender, acute at apex, and bent obliquely backward; surface feebly convex, with a narrow obsolete transverse groove on each side along base, densely finely granulose, the granules nearly concealed by the long recumbent cinereous pubescence, and with a few long erect black hairs intermixed. Scutellum broadly rounded behind. Elytra distinctly wider than pronotum at middle and moderately convex; sides nearly parallel to apical third, then arcuately rounded to the tips, which are separately narrowly rounded; surface coarsely densely punctate, the punctures more or less arranged in rows at middle of disk and becoming obsolete toward apex, sparsely clothed with short brown recumbent pubescence, with numerous long erect black hairs intermixed, and ornamented with cinereous pubescent spots as noted above. Beneath finely densely punctate, rather densely clothed with moderately long recumbent cinereous pubescence, and with numerous long erect black hairs on the legs; last abdominal segment broadly rounded at apex.

Female.—Similar to male, but larger and more robust, pronotum not quite as densely pubescent, and the last abdominal segment truncate at apex, with a deep narrow triangular depression along apical margin, and a narrow longitudinal median carina.

Length, 6.5 to 8 millimeters; width, 2.5 to 3.25.

Type locality.—Davao, Mindanao, Philippines.

Other localities.—Los Baños, Luzon, and Sibuyan Island, Philippines.

Type, allotype, and paratype in United States National Museum; paratypes in the collection of C. F. Baker.

Described from six specimens, the type, allotype, and one male and female paratypes from Davao (*Baker 13493*), one female paratype from Sibuyan Island, and a male paratype from Los Baños.

This species is closely allied to *E. lachrymosus* Pascoe, described from Sarawak, but has the head and pronotum densely pubescent, while in *lachrymosus,* according to the description, the head has only a few scattered hairs in front, and the pronotum a very thin pubescence, principally at the sides.

Exocentrus badius sp. nov.

Female.—Head brownish black, strongly reddish in front; pronotum and elytra reddish brown, the latter rather densely ornamented with more or less rounded cinereous pubescent spots, except for a large round brown space on each elytron just behind the middle; beneath reddish brown, with a strong yellowish tinge on abdomen.

Head strongly transverse and nearly flat in front, slightly wider than pronotum at apex, and flat between the antennal tubercles, which are short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, rather densely, finely granulose, the granules distinctly separated, sparsely clothed with long semierect cinereous pubescence, and with a few long erect black hairs intermixed; mandibles black; palpi dark brown, the tips paler; eyes very large and deeply emarginate, the lower lobes quadrate and strongly convex, the upper lobes small and separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ slightly longer than body (last three joints missing), slender, dark reddish brown, rather densely clothed with short recumbent cinereous pubescence, and with numerous long erect black hairs intermixed; first joint extending slightly beyond middle of pronotum, rather robust, and subfusiform; third joint three-fourths as long as first joint, and subequal in length to fourth. Pronotum nearly one and three-fourths times as wide as long, distinctly narrower at base than apex; sides feebly obliquely expanded from apical angles to a slender tooth placed slightly behind middle, then strongly obliquely narrowed to base, the tooth long, slender, acute at apex, and bent obliquely backward; surface feebly convex, with a broad obsolete transverse depression along base, densely finely granulose, the granules confluent on some parts, rather densely clothed with long, more or less recumbent cinereous pubescence, and with a few long erect stiff black hairs intermixed. Scutellum broadly rounded behind and densely pubescent. Elytra distinctly wider than pronotum at middle and moderately convex; sides nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface coarsely, densely, and irregularly punctate, the punctures becoming obsolete toward apex, sparsely clothed with fine brown recumbent pubescence and ornamented with numerous more or less rounded cinereous pubescent spots, except for a large round brown space on each elytron just behind middle. Beneath finely, densely punctate, densely clothed with moderately long recumbent cinereous pubescence and with a few long erect black hairs on the legs; last abdominal segment truncate at apex, with a slight emargination at middle, transversely narrowly grooved along apical margin, and with a narrow longitudinal median carina, but without a distinct depression in front of groove.

Length, 5 millimeters; width, 2.

Type locality.—Davao, Mindanao, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality (*Baker 13494*).

Exocentrus albovarius sp. nov.

Female.—Head black, slightly reddish behind epistoma; pronotum and elytra dark brown, the latter densely ornamented with more or less rounded cinerous pubescent spots, and with an irregularly shaped brown space on each elytron just behind middle; beneath reddish brown, with the abdomen slightly yellowish on the median parts.

Head strongly transverse and nearly flat in front, about as wide as pronotum at apex, and feebly concave between the antennal tubercles, which are widely separated; surface with a rather broad shallow longitudinal groove extending from occiput to epistoma, nearly smooth, rather densely clothed with long semierect cinereous pubescence, and with numerous long erect black hairs intermixed; mandibles black, slightly reddish at base; palpi black, the tips yellowish; eyes moderately large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes smaller and separated from each other on the top by half the distance that separates the lower lobes on the front. Antennæ about as long as body (last two joints missing), slender, uniformly dark brown, rather densely clothed with short recumbent cinereous pubescence, and with numerous long erect black hairs intermixed; first joint extending slightly beyond middle of pronotum, rather robust, and nearly cylindrical; third joint three-fourths as long as first joint and subequal in length to fourth. Pronotum twice as wide as long and distinctly narrower at base than apex; sides nearly parallel from apical angles to a broad tooth placed near base, then nearly transversely narrowed to base, the tooth rather short, acute at apex, and bent backward nearly in a line with elytra; surface feebly convex, with an obsolete transverse depression along base, densely obsoletely granulose, densely clothed with long semierect cinereous pubescence (obscuring most of the granules), and with a few long erect black hairs intermixed. Scutellum broadly rounded behind and densely pubescent. Elytra distinctly wider than pronotum at middle and moderately convex; sides nearly parallel to behind middle where they are feebly arcuately expanded, then arcuately attenuate to the tips, which are separately narrowly rounded; surface coarsely and rather densely punctate, the punctures more or less arranged in rows on middle of disk, and extending nearly to apex, sparsely clothed with fine brown pubescence and ornamented with numerous, more or less rounded, cinereous pubescent spots, with an irregularly shaped brown space on each elytron behind middle, and with numerous long erect black hairs intermixed. Beneath finely densely punctate, and densely clothed with moderately long recumbent cinereous pubescence, with numerous long erect hairs intermixed; last abdominal segment truncate at apex, with a slight emargination at middle, transversely narrowly grooved along apical margin, and with a narrow longitudinal median carina, but without a distinct depression in front of the groove.

Male.—Similar to female, but smaller and slenderer, antennæ slightly longer, elytra not much wider than pronotum at middle, and the markings more confluent, abdomen beneath not as densely pubescent, and last abdominal segment broadly rounded at apex.

Length, 3.5 to 5 millimeters; width, 1.4 to 2.

Type locality.—Davao, Mindanao, Philippines.

Type and allotype in United States National Museum; paratype in collection of C. F. Baker.

Described from three specimens, two females and one male, all collected at the type locality (*Baker 13496*).

This species is very closely allied to *E. badius* sp. nov., but the coloration is a darker brown; head not granulose; eyes are more widely separated from each other on the top; pronotum is wider; the tooth is broad, situated close to base, and bent backward on a line with elytra; and the brown space on each elytron behind the middle is irregular in shape.

Exocentrus hirtus sp. nov.

Male.—Above light brown, with the pronotum tinged with yellow, the elytra ornamented with elongate yellowish white pubescent spots arranged in longitudinal rows, and with a more or less distinct brown spot on each elytron just behind the middle; beneath reddish brown, the legs slightly darker.

Head strongly transverse and nearly flat in front, distinctly wider than pronotum at apex, slightly concave between the antennal tubercles, which are rather short and widely separated; surface with a narrow longitudinal groove extending from occiput to vertex, and rather deeply impressed between the antennæ, rather densely, finely granulose, the granules distinctly separated, sparsely clothed with moderately long recumbent yellowish white pubescence, and with a few long erect black hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes very large and deeply emarginate, the lower lobes quadrate and strongly convex, the upper lobes small and separated from each other on the top by about one-fourth the distance that separates the lower lobes on the front. Antennæ nearly one and one-half times as long as body, slender, reddish brown, base of joints slightly paler, sparsely clothed with inconspicuous pubescence and with numerous long erect black hairs intermixed; first joint extending to middle of pronotum, rather robust, and feebly clavate; third joint three-fourths as long as first joint, and subequal in length to fourth. Pronotum twice as wide as long, and slightly narrower at base than apex; sides feebly expanded from apical angles to a slender tooth placed slightly behind middle, then strongly obliquely narrowed to base, the tooth rather long, slender, acute at apex, and bent obliquely backward; surface feebly convex, with a narrow transverse groove along anterior and posterior margins, densely, finely punctate, with a few larger punctures from which arises a long erect stiff black hair, and rather densely clothed with long recumbent yellowish white pubescence. Scutellum broadly rounded behind and densely pubescent. Elytra slightly wider than pronotum at middle and moderately convex; sides nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface with rows of coarse, closely placed punctures, the rows extending nearly to apex, between which are a few coarse black elevated punctures from which arises a long erect stiff black hair, rather densely clothed with short brown recumbent pubescence, and ornamented with yellowish white pubescent markings as noted above. Beneath finely densely punctate, and densely clothed with moderately long recumbent yellowish pubescence, and with long erect black hairs, especially on the legs; last abdominal segment subtruncate at apex.

Length, 5 millimeters; width, 1.9.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single male specimen collected at the type locality (*Baker 13490*).

This species is closely allied to *E. mindanaoensis* sp. nov., but is light brown above, the eyes are not as widely separated on the top, and the pubescence on the elytra is more or less arranged in longitudinal rows.

Exocentrus philippinus sp. nov.

Female.—Head black; pronotum reddish brown, slightly paler along anterior and posterior margins; elytra brownish black, with a slight reddish tinge in some parts, and irregularly ornamented with yellowish white pubescence, which forms a more distinct broad irregular fascia at apical third; beneath black, with the median parts and legs more or less reddish.

Head moderately transverse and nearly flat in front, as wide as pronotum at apex, and feebly concave between the antennal tubercles, which are short and widely separated; surface with a narrow obsolete longitudinal groove extending from occiput to epistoma, rather densely, finely granulose, the granules somewhat confluent on the median part, sparsely clothed with moderately long semierect cinereous pubescence, and with a few long erect black hairs intermixed; mandibles black; palpi black, the tips reddish; eyes very large and deeply emarginate, the lower lobes quadrate and strongly convex, the upper lobes narrow and separated on the top by half the distance that separates the lower lobes on the front. Antennæ slightly longer than body, rather slender, reddish brown, base of first eight joints slightly more reddish, sparsely clothed with short recumbent cinereous pubescence, and with numerous long erect hairs intermixed; first joint long, extending nearly to base of pronotum, rather robust and cylindrical; third joint two-thirds as long as first joint, and subequal in length to fourth, the following joints gradually diminishing in length. Pronotum one and three-fifths times as wide as long, and distinctly narrower at base than apex; sides nearly parallel from anterior margin to a rather broad tooth placed just behind middle, then strongly arcuately emarginate to base, the tooth long, acute at apex, and bent obliquely backward; surface feebly convex, obsoletely transversely depressed along base, densely finely granulose, the granules more or less confluent and with a few larger ones intermixed, rather densely clothed with long recumbent yellowish white pubescence, and with a few long erect black hairs over the surface. Scutellum broadly rounded behind and densely pubescent. Elytra distinctly wider than pronotum at middle and somewhat depressed on basal half; sides nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface coarsely, densely, and irregularly punctate, the punctures becoming obsolete toward apex, sparsely clothed with short inconspicuous brown pubescence, with numerous long erect stiff black hairs intermixed, and ornamented with yellowish white pubescence as follows: An obsolete broken humeral spot extending from lateral margin to middle of disk and backward to middle, with a few hairs of the same color extending obliquely backward to suture; a broad, more distinct, irregular fascia at apical third, behind which are a few longitudinal rows of small elongate spots extending to apex. Beneath finely densely punctate, densely clothed with long recumbent cinereous pubescence, and with a few long erect black hairs intermixed; last abdominal segment truncate at apex, transversely, narrowly, and deeply grooved along apical margin, and with a broad shallow depression in front of the groove.

Male.—Differs from female in being smaller and slenderer, antennæ slightly longer, head not quite as densely pubescent in front, and the last abdominal segment broadly rounded at apex.

Length, 4.5 to 7 millimeters; width, 1.75 to 2.5.

Type locality.—Sibuyan Island, Philippines.

Other localities.—Zamboanga and Davao, Mindanao, Philippines.

Type, allotype, and paratypes in United States National Museum; paratype in collection of C. F. Baker.

Described from five specimens. Type, allotype, and one male paratype from the type locality, one female paratype from Zamboanga (*Baker 13497*), and another female paratype from Davao (*Baker 6747*). The paratype from Zamboanga is slightly more reddish than the type.

Exocentrus angusticollis sp. nov.

Female.—Head brownish black; pronotum and elytra brown, the latter irregularly ornamented with cinereous pubescence; beneath yellowish brown.

Head strongly transverse and nearly flat in front, as wide as pronotum at apex, and feebly concave between the antennal tubercles, which are short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, rather densely, finely granulose, the granules distinctly separated, very sparsely clothed with moderately long cinereous pubescence, with a few long erect black hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes moderately large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes rather narrow and separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ not longer than body (tenth and eleventh joints missing), slender, uniformly yellowish brown, sparsely clothed with short inconspicuous pubescence, and with numerous long erect black hairs intermixed; first joint extending to middle of pronotum, rather robust, and subfusiform; third joint two-thirds as long as first joint, and subequal in length to fourth, the following joints only obsoletely shorter. Pronotum one and one-third times as wide as long, distinctly narrower at base than apex; sides nearly parallel to a broad tooth placed at basal third, then strongly arcuately emarginate to base, the tooth rather short, acute at apex, and bent obliquely backward; surface moderately convex, with a broad but not deep transverse depression along base, granulose similar to that of head, very sparsely clothed with long recumbent cinereous pubescence, and with a few long erect black hairs over the surface. Scutellum broadly rounded behind and densely clothed with long recumbent cinereous pubescence. Elytra distinctly wider than pronotum at middle and moderately convex; sides nearly parallel to middle, arcuately expanded at apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface densely coarsely punctate on sutural region and along lateral margins, the punctures forming more or less distinct rows on middle of disk and becoming obsolete near apex, very sparsely clothed with inconspicuous pubescence, and ornamented with longer recumbent cinereous pubescence, which is arranged in more or less broken longitudinal rows, forming an obsolete fascia at basal third and one just behind middle, between which is a more distinct broad transverse brown fascia; the surface is also clothed with numerous long erect stiff black hairs. Beneath finely densely punctate, rather densely clothed with moderately long recumbent cinereous pubescence, with a few long erect black hairs intermixed; last abdominal segment truncate at apex, with a small triangular emargination at middle, transversely narrowly grooved along apical margin, and with a broad triangular depression in front of groove.

Length, 3.4 millimeters; width, 1.25.

Type locality.—Dapitan, Mindanao, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality (*Baker 13511*).

This species is very closely allied to *E. moerens* Pascoe described from Singapore but, according to the description, that species has the cinereous markings on the elytra arranged differently, and the body beneath is somewhat different in color.

Myromeus fumosus sp. nov.

Female.—Above uniformly brownish black, densely pubescent, the elytra ornamented with yellowish white pubescent markings; beneath reddish black.

Head transverse and moderately convex in front, as wide as pronotum at apex, flat between the antennal tubercles, which are short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, densely obsoletely punctate, densely clothed with long recumbent cinereous pubescence, and with a few long erect hairs intermixed;

mandibles black, slightly reddish brown at base; palpi brownish yellow; eyes moderately large and deeply emarginate, the lower lobes rounded and feebly convex, the upper lobes narrow and separated from each other on the top by about half the distance that separates the lower lobes on the front. Antennæ one and one-third times as long as body, slender, uniformly brownish black, sparsely clothed with short recumbent brownish pubescence, except on basal part of intermediate joints where it is cinereous, and rather densely ciliate on underside with long erect black hairs; first joint extending to middle of pronotum, rather robust, and subfusiform; third joint about equal in length to first joint, and slightly shorter than fourth, the following joints gradually diminishing in length. Pronotum quadrate, base and apex about equal in width; sides slightly arcuately rounded, with a short acute tooth placed slightly behind middle, which is feebly inclined backward; surface moderately convex, coarsely but not very densely punctate, densely clothed with moderately long recumbent brownish gray pubescence, which is slightly more cinereous toward sides, and with a few long erect black hairs intermixed. Scutellum more or less triangular, subtruncate at apex. Elytra distinctly wider than pronotum at base, slightly depressed on basal half, sides nearly parallel to apical fourth, then arcuately attenuate to the tips, which are separately broadly rounded; surface coarsely and rather densely punctate, the punctures becoming obsolete toward apex, densely clothed with recumbent brownish gray pubescence, obsoletely marbled with cinereous pubescence, with a few long erect black hairs intermixed, each elytron ornamented with yellowish white pubescent markings as follows: An elongate spot placed obliquely near lateral margin at basal third, a very small spot along suture at basal third, a small round spot near apical third situated a considerable distance from lateral margin, and a large irregularly shaped spot along suture near apex. Beneath densely, finely punctate, rather densely clothed with moderately long recumbent cinereous pubescence, and with numerous long erect cinereous hairs intermixed; last abdominal segment with a deep semicircular depression at apex.

Male.—Similar to female, but differs from it in having the antennæ slightly longer; the elytra more obliquely attenuate from the humeral angles, and the markings more cinereous; the prosternum more densely clothed with fine long erect cinereous hairs; and the last abdominal segment broadly rounded at apex.

Length, 6.2 to 8.5 millimeters; width, 2.25 to 3.

Type locality.—Dapitan, Mindanao.

Other localities.—Basilan Island and Iligan, Mindanao, Philippines.

Type and allotype in United States National Museum; paratype in collection of C. F. Baker.

Described from three specimens. Female type from Dapitan, Mindanao, male allotype from Basilan Island (*Baker 13499*), and a male paratype from Iligan, Mindanao.

Myromeus fulvonotatus sp. nov.

Female.—Above brownish black, densely pubescent, with a distinct yellow pubescent spot on each side of elytra along lateral margin; beneath black, slightly reddish on the median parts.

Head transverse and moderately convex in front, as wide as pronotum at apex, feebly concave between the antennal tubercles, which are rather short and widely separated; surface with a narrow obsolete longitudinal groove on vertex, not extending on occiput nor on front, densely, finely, and distinctly punctate, densely clothed with long recumbent cinereous pubescence, and with numerous long erect hairs intermixed; mandibles black; palpi dark brown, the tips paler; eyes moderately large and deeply emarginate, the lower lobes rounded and moderately convex, the upper lobes narrow and separated on the top by about half the distance that separates the lower lobes on the front. Antennæ about one and one-fourth times as long as body, slender, uniformly black, sparsely clothed with short recumbent blackish pubescence, except on basal part of intermediate joints, where it is cinereous, and densely ciliate on underside with long erect black hairs; first joint extending to middle of pronotum, rather robust, and subfusiform or cylindrical; third joint about equal in length to first joint and distinctly shorter than fourth. Pronotum nearly quadrate, feebly narrower at base than apex; sides slightly arcuately rounded, with a short rather obtuse tooth at middle, which is not inclined backward; surface moderately convex, obsoletely broadly transversely depressed near base and apex, sparsely coarsely punctate, rather densely clothed with recumbent featherlike brownish and cinereous pubescence, and with a few long erect black hairs intermixed. Scutellum triangular, subtruncate at apex. Elytra distinctly wider than pronotum, slightly depressed on basal half, sides nearly parallel to apical third, then arcuately attenuate to the tips, which are separately broadly rounded; surface rather densely, coarsely punctate, the punctures nearly concealed by the pubescence and becoming obsolete toward apex, very densely clothed with moderately long recumbent cinereous pubescence, with a few long erect black hairs intermixed, each elytron ornamented with more or less obsolete light brown pubescent markings as follows: A large spot surrounding scutellum; a small round spot behind humerus; a similar spot along suture just in front of middle; and behind middle two fasciæ extending from lateral margin obliquely backward but not reaching suture; there is also a distinct spot of yellow pubescence just behind the humeral brown spot. Beneath densely finely punctate, rather densely clothed with short recumbent cinereous pubescence, the legs densely clothed with long erect hairs of the same color; last abdominal segment with a deep semicircular depression at apex.

Length, 6 millimeters; width, 2.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality.

Myromeus luzonicus sp. nov.

Female.—Above uniformly brownish black, densely clothed with cinereous pubescence, the elytra ornamented with distinct brownish pubescent markings; beneath black, slightly reddish on the median parts.

Head transverse and moderately convex in front, as wide as pronotum at apex, feebly concave between the antennal tubercles, which are rather short and widely separated; surface with a narrow longitudinal groove, extending from vertex to middle of front, densely, finely, and distinctly punctate, rather densely clothed with long recumbent cinereous pubescence, and with a few long erect hairs intermixed; mandibles black; palpi brownish yellow; eyes large and deeply emarginate, the lower lobes rounded and feebly convex, the upper lobes narrow and separated from each other on the top by a little less than half the distance that separates the lower lobes on the front. Antennæ about one and one-third times as long as body, slender, uniformly brownish black, sparsely clothed with short brown recumbent pubescence, and in addition the first eight joints more or less clothed with longer cinereous pubescence, and rather densely ciliate on underside with long erect black hairs; first joints extending to middle of pronotum, rather robust and cylindrical; third joint about equal in length to first, and only obsoletely shorter than fourth. Pronotum quadrate, apex slightly wider than base; sides slightly arcuately rounded, with a short acute tooth placed slightly behind middle, which is feebly inclined backward; surface moderately convex, densely coarsely punctate, densely clothed with moderately long recumbent cinereous pubescence, with numerous long erect black hairs intermixed. Scutellum more or less triangular and subtruncate at apex. Elytra distinctly wider than pronotum, slightly depressed on basal half, sides feebly obliquely attenuate to apical fourth, then strongly arcuately attenuate to the tips, which are separately broadly rounded; surface coarsely, densely punctate, the punctures becoming obsolete toward apex, very densely clothed with long recumbent cinereous pubescence, with a few long erect black hairs intermixed, each elytron ornamented with recumbent brown pubescent markings as follows: A transverse fascia near base, extending along suture to scutellum, and externally beyond middle of disk, where it is obliquely connected to a rounded spot behind humerus; a broad transverse fascia at middle, extending from near lateral margin to near suture, then obliquely forward along suture to near anterior fascia, to which it is narrowly connected; and a large irregular transverse spot at apical third, extending from lateral margin to suture, with anterior margin distinct and strongly arcuately rounded, posterior margin not distinctly defined. Beneath finely densely punctate, rather densely clothed with short recumbent cinereous pubescence, and with a few long erect hairs of the same color scattered over body and legs; last abdominal segment with a deep semicircular depression at apex.

Male.—Similar to female, but the specimen is badly rubbed, and the markings are more or less destroyed. It differs from the type in having the antennæ slightly longer; the elytra more obliquely attenuate from the humeral angles; the prosternum densely clothed with rather fine long erect cinereous hairs; and the last abdominal segment broadly rounded at apex.

Length, 8.75 to 9.5 millimeters; width, 2.75 to 3.1.

Type locality.—Mount Maquiling, Luzon.

Other locality.—Mount Limay, Luzon, Philippines.

Type and allotype in United States National Museum.

Described from two specimens, male and female; the female collected at Mount Maquiling (*Baker 13498*) and the male at Mount Limay (*Baker 3040*).

Enes luzonicus sp. nov.

Female.—Head and pronotum black and strongly shining; elytra brownish black, subopaque, and ornamented with cinereous pubescence; beneath black, with parts of sternum, base of femora and tibiæ brownish black or reddish brown; tarsi with the outer joints becoming paler.

Head transverse and strongly convex in front, about as wide as pronotum, feebly concave between the antennal tubercles, which are moderately long and widely separated; surface finely obsoletely punctate, rather densely clothed with moderately long semierect cinereous hairs, and with a few long erect hairs intermixed; mandibles reddish brown, becoming black at the tips; palpi luteous; eyes large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes narrow and separated from each other on the top by about one-third the distance that separates the lower lobes on the front. Antennæ about one and one-half times as long as body, slender, uniformly brownish black, sparsely clothed with short inconspicuous pubescence, and with numerous long erect hairs intermixed; first joint scarcely reaching to middle of pronotum, rather robust and fusiform; third joint equal in length to first and slightly shorter than fourth; the following joints gradually diminishing in length. Pronotum slightly longer than wide (exclusive of teeth at sides), base and apex about equal in width; sides nearly parallel, feebly constricted near anterior and posterior angles, and with a moderately long acute tooth near middle; base and anterior margin transversely truncate; surface regularly convex, with a broad, shallow transverse depression near base, and a similar indistinct one near anterior margin, finely obsoletely punctate, rather sparsely clothed with short inconspicuous cinereous pubescence, and with numerous long erect black hairs intermixed. Scutellum somewhat triangular and subtruncate at apex. Elytra considerably wider than pronotum, the sides nearly parallel to apical fourth, then arcuately attenuate to the tips, which are separately rounded; surface rather densely, coarsely punctate, the punctures regularly placed in rows on the basal two-thirds, but becoming obsolete toward apex, sparsely clothed with inconspicuous brown pubescence with numerous long erect hairs intermixed, and each elytron ornamented with moderately long recumbent cinereous pubescence as follows: A large irregular spot inclosing some small dark areas at basal fourth, extending from lateral margin to suture; a rather broad transverse fascia at apical third; a large spot covering apical fifth; and a few small round spots along suture. Beneath finely densely punctate, and rather densely clothed with moderately long recumbent cinereous pubescence, which is sparser on prosternum and legs, and with numerous long erect cinereous hairs; last abdominal segment with a large, deep, semicircular depression at apex.

Male.—Similar to female, but the eyes are closer together on the top, not as densely pubescent beneath, and the last abdominal segment rounded at apex and without the semicircular depression.

Length, 3.5 to 4.5 millimeters; width, 1 to 1.6.

Type locality.—Mount Maquiling, Luzon, Philippines.

Type and allotype in United States National Museum; paratype in collection of C. F. Baker.

Described from three specimens, two males and one female, all collected at the type locality (*Baker 13492, 21715*).

Enes marmoratus sp. nov.

Female.—Above black, subopaque, the elytra regularly variegated with cinereous pubescence; beneath reddish black, with base of femora reddish yellow.

Head transverse and strongly convex in front, about as wide as pronotum, nearly flat between the antennal tubercles, which are short and widely separated; surface sparsely obsoletely punctate, rather densely clothed with moderately long, semierect cinereous hairs, and with numerous long erect hairs intermixed; mandibles reddish brown, becoming black at the tips; palpi brownish yellow; eyes large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes narrow and separated from each other on the top by about one-third the distance that separates the lower lobes on the front. Antennæ one and one-third times as long as body, slender, reddish brown, with base of joints paler, sparsely clothed with short inconspicuous pubescence, and with numerous long erect hairs intermixed, first joint scarcely reaching to middle of pronotum, rather robust, and fusiform; third joint slightly shorter than first, and distinctly shorter than fourth joint, the following joints gradually diminishing in length. Pronotum slightly longer than wide and feebly narrower at base than apex; sides nearly parallel, distinctly so at base, and with a moderately long acute tooth placed slightly behind middle; surface regularly convex; with a distinct, moderately deep, transverse groove at basal third, densely finely punctate, rather densely clothed with short recumbent blackish pubescence, obsoletely marbled with cinereous pubescence, and with a few long erect hairs intermixed. Scutellum small, somewhat triangular, and narrowly rounded behind. Elytra considerably wider than pronotum, the sides parallel to apical fourth, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface rather densely, coarsely punctate, the punctures more or less arranged in rows at the sides, and becoming obsolete toward apex, rather sparsely clothed with short inconspicuous black pubescence, and irregularly variegated with coarser cinereous pubescence, except at base, a triangular spot along lateral margin near middle; at apex, where the spots are more widely separated, there are also numerous long erect hairs over the entire surface. Beneath finely densely punctate, and rather densely clothed with long cinereous pubescence, and with numerous long erect cinereous hairs intermixed; last abdominal segment broadly, deeply, triangularly, and abruptly flattened at apex.

Length, 4 millimeters; width, 1.3.

Type locality.—Dapitan, Mindanao, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality (*Baker 13491*).

Enes pallidus sp. nov.

Male.—Above uniformly light brown, subopaque, the elytra variegated with yellowish white pubescence; beneath reddish brown, with the median parts, base of femora, tibiæ, and tarsi more or less luteous.

Head transverse and strongly convex in front, about as wide as pronotum, nearly flat between the antennal tubercles, which are short and widely separated; surface with an obsolete longitudinal groove, sparsely obsoletely punctate, rather densely clothed with moderately long semierect yellowish white pubescence and with a few long erect hairs intermixed; mandibles reddish brown, the tips black; palpi luteous; eyes large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes narrow and separated from each other on the top by about one-third the distance that separates the lower lobes on the front. Antennæ about one and one-third times as long as body, slender, luteous, with the tips of the joints darker, sparsely clothed with short inconspicuous pubescence, and with numerous long erect black hairs intermixed; first joint not extending to middle of pronotum, rather robust and fusiform; third joint slightly longer than first and about subequal in length to fourth. Pronotum slightly longer than wide and feebly narrower at base than apex; sides nearly parallel and with a moderately long acute tooth at middle; surface regularly convex, with a broad shallow transverse groove at basal third, obsoletely punctate, densely clothed with long recumbent yellowish white pubescence (except for a narrow longitudinal glabrous spot at middle), and with a few long erect black hairs over the surface. Scutellum small, subtruncate at apex. Elytra considerably wider than pronotum, the sides parallel to middle, then gradually arcuately attenuate to the tips, which are separately narrowly rounded; surface rather densely, coarsely punctate in basal region, the punctures arranged in rows at the sides, and becoming obsolete on apical third, rather sparsely clothed with short inconspicuous brown pubescence, irregularly variegated with yellowish white pubescence, and each elytron with a more distinct large brown spot along lateral margin at middle; there are also numerous long erect black hairs over the entire surface. Beneath finely densely punctate, and rather densely clothed with moderately long cinereous pubescence, and with scarcely any longer hairs intermixed; last abdominal segment broadly rounded at apex.

Female.—Similar to male, only slightly darker, the head and pronotum more brownish black, the latter with the anterior margin paler, the eyes more widely separated from each other on the top, and the last abdominal segment with a deep semicircular depression at apex.

Length, 3.2 to 3.7 millimeters; width, 1.1 to 1.4.

Type locality.—Basilan Island, Philippines.

Type and allotype in United States National Museum.

Described from two specimens, male and female, collected at the type locality (*Baker 13510*).

Enes spinosus sp. nov.

Male.—Head and pronotum black, the latter with the anterior and posterior margins reddish yellow; elytra dark brown and densely variegated with more or less confluent cinereous spots; beneath reddish or brownish black, posternum and base of femora more or less luteous.

Head transverse and moderately convex in front, about as wide as pronotum, feebly concave between the antennal tubercles, which are rather short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, sparsely obsoletely punctate, sparsely clothed with rather short recumbent cinereous pubescence, and with a few long erect hairs intermixed; mandibles reddish brown, the tips black; palpi luteous; eyes large and deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes smaller and separated from each other on the top by about one-third the distance that separates the lower lobes on the front. Antennæ not much longer than body, slender, reddish brown, base of joints paler, sparsely clothed with short inconspicuous pubescence and with numerous long erect hairs intermixed; first joint not extending to middle of pronotum, rather robust, and fusiform; third joint about equal in length to first joint and distinctly shorter than fourth. Pronotum slightly longer than wide, apex and base about equal in width; sides nearly parallel, distinctly so at basal fourth, and with a moderately long acute tooth, placed slightly behind middle; surface regularly convex, with a broad shallow transverse groove at basal fourth, obsoletely punctate, rather densely clothed with fine recumbent cinereous pubescence (except a narrow obsolete glabrous spot on middle of disk), and with numerous long erect black hairs intermixed. Scutellum rather narrowly rounded behind. Elytra considerably wider than pronotum, the sides parallel to apical fourth, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface densely, coarsely punctate, the punctures more or less arranged in rows at sides of disk, and becoming obsolete toward apex, rather densely clothed with inconspicuous brown pubescence, and densely variegated with moderately long recumbent cinereous pubescence, the cinereous spots irregularly placed, confluent, and with a larger brown area around scutellum, numerous long erect hairs over entire surface, the hairs black on disk and cinereous at sides. Beneath densely finely punctate, densely clothed with moderately long recumbent cinereous pubescence, and with numerous long erect cinereous hairs intermixed; last abdominal segment broadly rounded at apex.

Length, 4.5 millimeters; width, 1.6.

Type locality.—Cuernos Mountains, Negros, Philippines.

Type in United States National Museum.

Described from a single male collected at the type locality.

Enes bakeri sp. nov.

Male.—Above uniformly black, head and pronotum strongly shining, elytra subopaque and sparsely irregularly ornamented with cinereous pubescence; beneath black, coxæ, base of femora, tibiæ, and tarsi more reddish.

Head transverse and strongly convex in front, about as wide as pronotum, nearly flat between the antennal tubercles, which are short and widely separated; surface with an obsolete longitudinal groove on vertex, sparsely obsoletely punctate, rather densely clothed with moderately long semierect cinereous pubescence, and with a few long erect hairs intermixed; mandibles reddish brown, the tips black; palpi yellowish brown; eyes large and nearly divided, the lower lobes rounded and strongly convex, the upper lobes smaller and separated from each other on the top by about one-third the distance that separates the lower lobes on the front. Antennæ only a little longer than body, slender, reddish brown, base of joints slightly paler, sparsely clothed with short inconspicuous pubescence, and with numerous long erect hairs intermixed; first joint not extending to middle of pronotum, rather robust and fusiform; third joint about equal in length to first joint and distinctly shorter than fourth. Pronotum distinctly longer than wide, apex and base about equal in width; sides nearly parallel, feebly constricted near anterior and posterior angles, and with a moderately long acute tooth, placed slightly behind middle; surface regularly convex, with a narrow, moderately deep transverse groove at basal fifth and a broad obsolete one near anterior margin, obsoletely punctate, sparsely clothed with very short inconspicuous cinereous pubescence, and with numerous long erect black hairs intermixed. Scutellum somewhat triangular, subtruncate at apex. Elytra considerably wider than pronotum, sides feebly attenuate from humeral angles to near apex, where they are more strongly arcuately attenuate to the tips, which are separately narrowly rounded; surface densely coarsely punctate, the punctures arranged in rows but becoming obsolete at apex, sparsely clothed with inconspicuous brown pubescence, with numerous long erect black hairs intermixed, each elytron ornamented with recumbent cinereous pubescence as follows: A small spot at middle of base; a crescent-shaped fascia (sometimes broken) along lateral margin behind humerus; a number of irregularly shaped spots, more or less confluent, on disk in front of a narrow transverse fascia at apical third, the fascia not extending to suture nor to lateral margin, and bent obliquely backward laterally, the apical area obsoletely covered with inconspicuous hairs of the same color. Beneath densely finely punctate, rather densely clothed with short recumbent cinereous pubescence, which is longer and more conspicuous along posterior margin of abdominal segments, and with numerous long erect hairs of the same color intermixed; last abdominal segment broadly rounded at apex.

Female.—Similar to male, but the antennæ a little shorter, sides of elytra more parallel, more reddish beneath, and last abdominal segment with a broad, deep, triangular depression at apex.

Length, 4 to 5 millimeters; width, 1.2 to 1.5.

Type locality.—Sibuyan Island, Philippines.

Other locality.—Cuernos Mountains, Negros, Philippines.

Type, allotype, and paratype in the United States National Museum; paratype in collection of C. F. Baker.

Described from four specimens, male and female, collected at the type locality (*Baker 21712, 21713*), and a male and female from Cuernos Mountains.

Enes sibuyana sp. nov.

Female.—Head and pronotum brownish black and strongly shining, the latter slightly reddish along anterior and posterior margins; elytra reddish brown, subopaque, slightly darker in scutellar region, more yellowish at apex, and irregularly ornamented with cinereous pubescent spots; beneath reddish brown, with prosternum and legs more or less reddish yellow.

Head transverse and moderately convex in front, about as wide as pronotum, feebly concave between the antennal tubercles, which are rather short and widely separated; surface sparsely obsoletely punctate, densely clothed with moderately long semierect cinereous pubescence, with a few long erect hairs intermixed; mandibles reddish brown, the tips black; palpi luteous; eyes large and nearly divided, the lower lobes rounded and strongly convex, the upper lobes smaller and separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ about one and one-third times as long as body, slender, reddish brown, the outer joints slightly paler at base, sparsely clothed with short inconspicuous pubescence, with numerous long erect hairs intermixed; first joint not quite extending to middle of pronotum, rather robust and fusiform; third joint about equal in length to first joint, and distinctly shorter than fourth. Pronotum distinctly longer than wide, base and apex about equal in width; sides nearly parallel, feebly constricted near base, with a moderately long acute tooth placed distinctly behind middle; surface regularly convex, with a narrow, moderately deep transverse groove near base, nearly smooth, sparsely clothed with very short inconspicuous pubescence, with numerous long erect black hairs intermixed. Scutellum triangular, rather acutely rounded at apex. Elytra considerably wider than pronotum, sides nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; surface densely, coarsely punctate, the punctures more or less arranged in rows at sides and becoming obsolete toward apex, sparsely clothed with inconspicuous brown pubescence, with numerous long erect black hairs intermixed, each elytron ornamented with recumbent cinereous pubescence as follows: A small spot at middle of base; two transverse spots along lateral margin behind humerus; a number of small irregularly placed spots on disk in front of a narrow transverse fascia at apical third, the fascia not quite reaching to suture but extending backward along lateral margin but not touching it; and an obsolete spot along suture midway between fascia and apex. Beneath densely finely punctate, rather densely clothed with short recumbent cinereous pubescence, which is longer and more conspicuous along posterior margin of abdominal segments, with long erect cinereous hairs, which are more abundant on the legs; last abdominal segment with a broad, deep, triangular depression at apex.

Length, 5.5 millimeters; width, 1.6.

Type locality.—Sibuyan Island, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality.

Enes setiger sp. nov.

Female.—Head and pronotum black, subopaque; elytra dark brown and rather regularly variegated over entire surface with small yellowish white pubescent spots; beneath yellowish brown, legs luteous, with the median parts of femora more or less brownish.

Head transverse and strongly convex in front, about as wide as pronotum, nearly flat between the antennal tubercles, which are short and widely separated; surface sparsely obsoletely punctate, densely clothed with long semierect cinereous pubescence, with a few long erect hairs intermixed; mandibles reddish brown, the tips black; palpi luteous; eyes large and nearly divided, the lower lobes rounded and strongly convex, the upper lobes smaller and separated from each other on the top by nearly one-third the distance that separates the lower lobes on the front. Antennæ about one and one-third times as long as body, slender, brownish yellow, base of joints slightly paler, sparsely clothed with short inconspicuous pubescence, with numerous long erect hairs intermixed; first joint not extending to middle of pronotum, rather robust, cylindrical or subfusiform; third joint about equal in length to first joint, and distinctly shorter than fourth. Pronotum distinctly longer than wide, apex and base about equal in width; sides nearly parallel, distinctly so at base, and with a moderately long acute tooth at middle; surface regularly convex, with a broad shallow transverse depression at basal third, and a similar indistinct one at apical third; finely densely punctate, sparsely clothed with short indistinct cinereous pubescence, with four obsolete darker spots on disk, with a few long, erect black hairs. Scutellum small and broadly rounded behind. Elytra considerably wider than pronotum, the sides parallel to apical fourth, then arcuately attenuate to the tips, which are separately broadly rounded; surface densely, coarsely punctate, the punctures irregularly placed in scutellar region, but arranged in rows at sides and posteriorly, and extending nearly to apex, rather densely clothed with short inconspicuous brown pubescence, and variegated with small yellowish white pubescent spots; there are also numerous long erect black hairs over the entire surface. Beneath densely finely punctate, rather densely clothed with moderately long cinereous pubescence, with numerous long erect white hairs intermixed; last abdominal segment with a deep simicircular depression at apex.

Length, 4.2 millimeters; width, 1.5.

Type locality.—Basilan Island, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality.

Enes scutellaris sp. nov.

Female.—Above reddish brown, pronotum slightly darker on disk, elytra ornamented with dark brown areas as follows: A large scutellar spot; a small spot at humeral angles; a rather broad transverse fascia at middle, not extending to suture, but strongly constricted at middle; and the entire apical third, inclosing a large, more or less triangular pale space; all of these dark areas, except the scutellar one, are connected to each other along the lateral margins; beneath yellowish brown, legs luteous, apex of femora and tibiæ brownish.

Head transverse and moderately convex in front, about as wide as pronotum, feebly concave between the antennal tubercles, which are rather short and widely separated; surface densely finely punctate, rather densely clothed with short recumbent brownish yellow pubescence, with a few longer, erect hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes large and deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes smaller and separated from each other on the top by about half the distance that separates the lower lobes on the front. Antennæ one and one-half times as long as body, slender, dark brown, scape and base of other joints brownish yellow, sparsely clothed with short inconspicuous pubescence, and with numerous long, erect hairs intermixed; first joint not extending to middle of pronotum, rather robust, cylindrical, and feebly arcuate; third joint about equal in length to first joint, and distinctly shorter than fourth. Pronotum slightly wider than long, apex and base about equal in width; sides parallel, with a moderately long, acute tooth placed slightly behind middle, which is feebly inclined backward; surface regularly convex, with a broad transverse obsolete depression at basal third, finely densely punctate, densely clothed with moderately long recumbent pubescence, which is denser and more yellowish at middle and toward sides, and with numerous long erect black hairs intermixed; there is also on each side of middle, parallel with the lateral teeth, a large round deep puncture. Scutellum broadly rounded behind. Elytra considerably wider than pronotum, somewhat depressed above, sides parallel to apical third, then arcuately attenuate to the tips, which are separately broadly rounded; surface with an obsolete longitudinal carina extending from humeri backward to near middle, densely coarsely punctate, the punctures more or less arranged in rows and becoming obsolete toward apex, densely clothed, except on the scutellar dark area, with moderately long recumbent pubescence (brown or reddish brown on the dark areas and yellowish white on the pale areas) as noted above. Beneath finely densely punctate, densely clothed with fine recumbent yellowish white pubescence, with numerous long erect hairs on the legs; last abdominal segment with a deep semicircular depression at apex.

Length, 4.8 millimeters; width, 1.9.

Type locality.—Sibuyan Island, Philippines.

Type in United States National Museum; paratype in collection of C. F. Baker.

Described from two females collected at the type locality (*Baker 21711*). The paratype is slightly paler than the type, but otherwise they are identical.

Xaenapta denticollis sp. nov.

Female.—Above dark brown, elytra slightly reddish on disk and ornamented with cinereous pubescence; beneath reddish brown, legs more or less luteous.

Head transverse and moderately convex in front, as wide as pronotum, and flat between the antennal tubercles, which are short and widely separated; surface sparsely scabrous, rather sparsely clothed with moderately long semierect cinereous pubescence, with numerous long erect hairs intermixed; mandibles reddish brown, becoming black at the tips; palpi brownish yellow; eyes moderately large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes narrow and widely separated from each other on the top. Antennæ about one and one-half times as long as body, slender, uniformly light brown except the first four joints, which are slightly paler toward base, sparsely clothed with short inconspicuous pubescence, ciliate on underside with long erect black hairs; first joint short, extending to middle of pronotum, subcylindrical, but not very robust; third joint slightly longer than first joint and distinctly shorter than fourth, the following joints gradually diminishing in length. Pronotum slightly wider than long and distinctly narrower at base than apex; sides arcuately rounded and armed with a number of short acute teeth; surface feebly convex, sparsely, rather finely scabrous, with a large puncture on each side behind middle, and situated midway between lateral margin and middle, rather densely clothed on median line and at sides with moderately long recumbent cinereous pubescence, and with numerous long erect inconspicuous hairs intermixed. Scutellum broadly rounded at apex and densely clothed with cinereous pubescence. Elytra about as wide as pronotum at middle, sides parallel to apical third, then arcuately attenuate to the tips, which are separately narrowly rounded; surface densely, coarsely punctate, the punctures irregularly placed toward suture and lateral margins, but arranged in rows at middle of disk, and becoming more obsolete toward apex, rather densely variegated with moderately long recumbent cinereous pubescence, except for a dark area around scutellum and along lateral margins, and also clothed with numerous long erect fine hairs. Beneath densely obsoletely punctate, rather densely clothed with moderately long recumbent cinereous pubescence, with numerous long erect hairs of the same color intermixed, the longer hairs very conspicuous on the legs; last abdominal segment transversely narrowly flattened at apex, and with a moderately deep triangular depression in front of the flattened area.

Length, 4.25 millimeters; width, 1.4.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality.

Xaenapta bakeri sp. nov.

Female.—Head black; pronotum and elytra brownish black, the latter with distinct silvery white pubescent markings; beneath brownish black, with a slight reddish tinge, tarsi paler.

Head transverse and moderately convex in front, as wide as pronotum, and flat between the antennal tubercles, which are short and widely separated; surface sparsely obsoletely scabrous, densely clothed with moderately long recumbent cinereous pubescence, with a few long erect hairs intermixed; mandibles reddish brown, the tips black; palpi brownish yellow; eyes moderately large and very deeply emarginate, the lower lobes rounded and strongly convex, and the upper lobes narrow and widely separated from each other on the top. Antennæ one and one-half times as long as body, slender, reddish brown, becoming yellowish brown on the outer joints, sparsely clothed with short recumbent cinereous pubescence (the pubescence more yellowish and inconspicuous on the outer joints), and sparsely ciliate on underside with long erect black hairs; first joint short, extending to middle of pronotum, subcylindrical, feebly arcuate, but not very robust; third joint slightly shorter than fourth joint, which is subequal in length to first. Pronotum slightly wider than long, and distinctly narrower at base than apex; sides arcuately rounded and armed with a number of short acute teeth; surface feebly convex, sparsely coarsely scabrous, rather densely clothed over entire surface, except a triangular median space along anterior margin, with moderately long recumbent cinereous pubescence with numerous long erect black hairs intermixed. Scutellum broadly rounded behind and densely clothed with cinereous pubescence. Elytra about as wide as pronotum at middle, sides parallel to apical third, then arcuately attenuate to the tips, which are separately narrowly rounded; surface densely coarsely punctate, the punctures irregularly placed, except on middle of disk where they are more or less arranged in rows, becoming obsolete toward apex, densely clothed with short silvery white pubescence, except the dark areas where the surface is sparsely clothed with inconspicuous black pubescence, and are arranged as follows: A rather broad fascia extending from humeri obliquely backward to suture at basal third and forming the letter V common to both elytra; a narrow fascia just behind the anterior one, extending from behind humeri obliquely backward to suture, parallel to anterior fascia and forming the letter U, this fascia extending forward along the lateral margins, where it is connected to the anterior fascia, and also backward along the margins for a short distance, and obsoletely connected to a large, more or less triangular spot along margin at middle; and a narrow transverse fascia at apical third, the margins of the fascia more or less undulated; the surface is also clothed with numerous long erect black hairs. Beneath finely densely punctate, rather densely clothed with short recumbent silvery white pubescence, and with numerous long erect hairs intermixed; last abdominal segment transversely, narrowly flattened at apex, with a broad but not deep depression in front of the flattened area.

Length, 5.2 millimeters; width, 1.7.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality (*Baker 13500*).

Aegocidnus flavomaculatus sp. nov.

Head brownish yellow; pronotum reddish brown; elytra dark reddish brown, with distinct slightly paler areas densely clothed with yellowish pubescence; beneath reddish or brownish yellow, base of femora luteous, and tibiæ, apex of femora, and first tarsal joints brown.

Head nearly quadrate and feebly convex in front, slightly wider than pronotum at apex, moderately concave between the antennal tubercles, which are rather short and widely separated; surface coarsely sparsely punctate, and sparsely clothed with moderately long recumbent yellowish pubescence; mandibles reddish brown, the tips black; palpi luteous; eyes rather large and very deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes small and separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ nearly twice as long as body, slender, dark brown, base of joints luteous, sparsely clothed with short recumbent pubescence, and rather densely ciliate on underside with longer hairs; first joint extending to middle of pronotum, rather robust, subcylindrical; third joint slightly longer than first and fourth joints, the following joints gradually diminishing in length. Pronotum quadrate, base and apex about equal in width; sides feebly arcuately rounded, with a very small acute tooth placed slightly behind middle; surface moderately convex, without transverse depressions, densely coarsely punctate and sparsely clothed with short recumbent yellowish pubescence on basal half of disk. Scutellum small and narrowly rounded posteriorly. Elytra distinctly wider than pronotum and feebly depressed on basal half; sides nearly parallel to apical third, then arcuately attenuate to the tips, which are separately narrowly rounded; surface densely coarsely punctate, the punctures more or less arranged in longitudinal rows, except along suture, where they are irregularly distributed, sparsely clothed with short inconspicuous brown pubescence, each elytron ornamented with moderately long recumbent yellowish pubescence as follows: A small round spot at base; a large, broad, crescent-shaped spot placed longitudinally on disk at basal third; a transverse fascia at apical third, extending from lateral margin to near suture; and a small obsolete area near apex. Beneath densely obsoletely punctate, with a few coarse deep punctures intermixed on first two abdominal segments, and sparsely clothed with short recumbent yellowish pubescence; last abdominal segment rather broadly rounded at apex.

Length, 3.2 millimeters; width, 1.2.

Type locality.—Mount Maquiling, Luzon, Philippines.

Type in United States National Museum.

Described from a single example (sex undetermined) collected at the type locality.

Miaenia rufula sp. nov.

Uniformly pale reddish brown, elytra irregularly ornamented with yellowish white pubescence.

Head quadrate and nearly flat in front, about as wide as pronotum at apex, slightly concave between the antennal tubercles, which are rather short and widely separated; surface coarsely but not very densely punctate, sparsely clothed with recumbent yellowish white pubescence; mandibles reddish, the tips black; palpi luteous; eyes moderately large and deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes narrow and separated from each other on the top by a little less than half the distance that separates the lower lobes on the front. Antennæ nearly twice as long as body, slender, dark brown, base of joints and first two or three joints slightly paler, sparsely clothed with short inconspicuous pubescence, and sparsely ciliate on underside with longer hairs; first joint scarcely extending to middle of pronotum, rather robust and subcylindrical; third joint twice as long as first joint and subequal in length to fourth, the following joints gradually diminishing in length. Pronotum quadrate, apex and base about equal in width; sides feebly arcuately rounded, with a small, straight, acute tooth placed slightly behind middle, surface moderately convex, broadly transversely depressed along anterior and posterior margins, the depressions only obsoletely indicated (not sulcate), coarsely and rather densely punctate, and rather densely clothed with moderately long recumbent yellowish white pubescence, which is evenly distributed and does not form any design. Scutellum somewhat triangular, broadly rounded posteriorly. Elytra distinctly wider than pronotum and moderately convex; sides feebly obliquely expanded from humeral angles to apical third, where they are widest, and arcuately rounded, then arcuately attenuate to the tips, which are separately narrowly rounded; surface coarsely, densely, and irregularly punctate, sparsely clothed with moderately long recumbent yellowish white pubescence, forming irregularly shaped designs over the entire surface, and a more or less distinct transverse fascia near basal third. Beneath rather densely, coarsely punctate, and sparsely clothed with short inconspicuous recumbent pubescence; last abdominal segment broadly rounded at apex.

Length, 2.8 millimeters; width, 1.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single example, probably a male, collected at the type locality.

Miaenia variegata sp. nov.

Head and pronotum brownish black; elytra slightly more reddish brown, and ornamented with cinereous pubescent designs; beneath brownish black, base of femora, tibiæ, and tarsi reddish.

Head slightly transverse and feebly convex in front, about as wide as pronotum at apex, nearly flat between the antennal tubercles, which are short and widely separated; surface coarsely sparsely punctate, and sparsely clothed with short recumbent cinereous pubescence; mandibles black; palpi brownish yellow; eyes large and deeply emarginate, the lower lobes rounded and strongly convex, the upper lobes rather large, close together, and separated from each other on the top by one-fifth the distance that separates the lower lobes on the front. Antennæ slender (last four joints missing), dark brown, sparsely clothed with short inconspicuous pubescence, and sparsely ciliate on underside with longer hairs; first joint extending to about middle of pronotum, rather robust and subcylindrical; third joint not quite twice as long as first joint, and subequal in length to fourth. Pronotum quadrate, base and apex about equal in width; sides feebly arcuately rounded, more strongly narrowed near base, and with a small slender acute tooth placed at basal third; surface moderately convex, without transverse depressions, coarsely densely punctate, and sparsely clothed with short recumbent silvery white pubescence. Scutellum somewhat triangular and broadly rounded posteriorly. Elytra slightly wider than pronotum, and moderately convex; sides parallel to apical third, then arcuately attenuate to the tips, which are separately narrowly rounded; surface densely, coarsely, and irregularly punctate, sparsely clothed with inconspicuous brown pubescence, and rather densely variegated with moderately long recumbent silvery white pubescence, which forms a more or less distinct transverse fascia at middle and apical third, between which is a dark brown area extending from lateral margins to near suture. Beneath sparsely coarsely punctate, and sparsely clothed with moderately long recumbent cinereous pubescence; last abdominal segment broadly rounded at apex.

Length, 3.25 millimeters; width, 1.2.

Type locality.—Surigao, Mindanao, Philippines.

Type in United States National Museum.

Described from a single example (sex undetermined), collected at the type locality.

Sciades sibuyanensis sp. nov.

Head and pronotum dark reddish brown; elytra brownish black, basal half of disk light reddish brown, and ornamented with irregularly shaped cinereous pubescent markings; beneath reddish brown, with a slight yellowish tinge on the legs.

Head distinctly transverse and feebly convex in front, scarcely wider than pronotum at apex, broadly concave between the antennal tubercles, which are rather short and widely separated; surface coarsely but not very densely punctate, and rather densely clothed with moderately long recumbent cinereous pubescence;

mandibles reddish brown, the tips black; palpi brownish yellow; eyes moderately large and deeply emarginate, the lower lobes slightly longer than wide and strongly convex, the upper lobes rather narrow and separated from each other on the top by nearly half the distance that separates the lower lobes on the front. Antennæ slightly longer than body, rather robust, reddish brown, with joints 4 to 10 slightly paler at base, sparsely clothed with short recumbent pubescence, and sparsely ciliate on underside with longer hairs; first joint short, extending only slightly beyond anterior margin of pronotum, rather robust and subfusiform; third joint subequal in length to first and fourth joints, the following joints shorter and gradually diminishing in length. Pronotum slightly wider than long, base and apex about equal in width; sides feebly arcuately rounded, more strongly narrowed near base, and with a small slender acute tooth placed at basal third; surface moderately convex, without transverse depressions, sparsely coarsely punctate, and densely clothed with moderately long recumbent cinereous pubescence, the pubescence evenly distributed, except for an oblong spot on each side of middle where the pubescence is brownish. Scutellum rather broadly rounded posteriorly. Elytra distinctly wider than pronotum and moderately convex; sides nearly parallel to apical fourth, then strongly arcuately attenuate to the tips, which are separately narrowly rounded; surface densely, coarsely, and irregularly punctate, sparsely clothed with short inconspicuous pubescence, each elytron ornamented with irregularly shaped cinereous pubescent spots over the entire surface, with the exception of a small area at scutellum extending backward along suture, and a broad transverse brown fascia situated slightly behind the middle and extending from lateral margin to near suture. Beneath densely, finely, and obsoletely rugose, with a few rather coarse punctures intermixed, rather densely clothed with moderately long recumbent cinereous pubescence; last abdominal segment subtruncate at apex, with a narrow transverse groove along apical margin, in front of which the surface is broadly but not deeply depressed.

Length, 4.3 millimeters; width, 1.6.

Type locality.—Sibuyan Island, Philippines.

Type in United States National Museum.

Described from a unique example, probably a female, collected at the type locality.

This species is not entirely congeneric, and seems to be more or less intermediate between *Sciades* and *Exocentrus;* it is nearer to the species of the latter genus which have the pronotum scarcely wider than long and the lateral spines on the pronotum very small, as in *moerens* Pascoe. It differs from *Sciades* in having the antennæ more robust and the first, third, and fourth joints subequal in length. From *Exocentrus* it is at once separated by the absence of the long erect stiff hairs on the body and antennæ. It seems advisable to retain the species in the genus *Sciades* temporarily until more material is available for study.

Camptomyne philippinus sp. nov.

Male.—Head, pronotum, and scutellum reddish yellow; elytra violaceous black and strongly shining; beneath dark brown, the median parts more or less reddish yellow.

Head slightly transverse and nearly flat in front, wider than pronotum at apex, flat between the antennal tubercles, which are very short and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, finely densely granulose, the granules distinctly separated, sparsely clothed with inconspicuous semierect pubescence and with numerous long erect black hairs intermixed; mandibles reddish yellow, the tips black; palpi dark brown, the tips paler; eyes large and very deeply emarginate, the lower lobes longer than wide and strongly convex, the upper lobes small and separated from each other on the top by not quite one-fourth the distance that separates the lower lobes on the front. Antennæ slightly longer than body, rather robust, uniformly dark brown, sparsely clothed with short inconspicuous pubescence, with numerous long erect black hairs intermixed; first joint scarcely extending to middle of pronotum, rather robust and subfusiform; third joint two-thirds as long as first joint,and subequal in length to fourth. Pronotum slightly wider than long, base and apex about equal in width; sides feebly obliquely expanded from apical angles to a short slender tooth placed slightly behind middle, then strongly arcuately narrowed to base, the tooth acute at apex, and extending obliquely backward; surface feebly convex, with a broad obsolete transverse depression near anterior and posterior margins, densely finely granulose, sparsely clothed with inconspicuous pubescence, and with a few long erect black hairs intermixed. Scutellum small and broadly rounded behind. Elytra distinctly wider than pronotum at middle and moderately convex; sides parallel to apical third, then arcuately attenuate to the tips, which are separately narrowly rounded; surface coarsely densely punctate, the punctures irregularly placed at base and along suture and lateral margins, but more or less arranged in rows on middle of disk, sparsely clothed with moderately long semierect cinereous pubescence, and with numerous long erect stiff black hairs intermixed. Beneath densely obsoletely punctate, sparsely clothed with recumbent cinereous pubescence, which is denser and longer along the anterior margin of the abdominal segments, and with numerous long erect black hairs intermixed on the legs; abdominal segments with an obsolete depression on each side, the last segment subtruncate at apex.

Female.—Similar to male, but the antennæ slightly shorter, and the last abdominal segment truncate at apex, with a small triangular emargination at middle, transversely narrowly grooved along apical margin, obsoletely depressed in front of the groove, and with a narrow longitudinal median carina.

Length, 3 to 4 millimeters; width, 1.25 to 1.75.

Type locality.—Mount Banahao, Luzon, Philippines.

Other locality.—Northwestern Panay, Philippines.

Type, allotype, and paratype in United States National Museum; paratypes in collection of C. F. Baker.

Described from five specimens. Type, allotype, and two male paratypes from the type locality (*Baker 6051, 13501*) and one male paratype from Panay. One paratype (*Baker 6051*) is considerably paler than the type, but this is due to its being an immature specimen.

This species is very closely allied to *callioides* Pascoe but, according to the description given for that species, differs from it in having the head wider than the pronotum, the last two joints of the tarsi not yellow, and other minor details.

Camptomyne philippinus var. **unicolor** var. nov.

Female.—Above uniformly yellowish brown and feebly shining; beneath similar to the species except the tibiæ, which are darker brown. Eyes separated from each other on the top by one-third the distance that separates the lower lobes on the front. Antennæ about as long as body.

Length, 4.5 millimeters; width, 1.75.

Type locality.—Davao, Mindanao, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality. This specimen is fully matured, and shows no trace of the violaceous color found in immature specimens of *philippinus*.

Since it does not differ from the species in any important structural characters, I am simply considering it as a color variety.

Camptomyne insularis sp. nov.

Female.—Closely allied to *philippinus* sp. nov. but differing from it as follows: Body broader in relation to its length; head, pronotum, and scutellum brownish yellow; elytra brownish black, moderately shining, the cinereous pubescence arranged in more or less broken longitudinal rows; antennæ shorter than body; beneath dark brown, with the median parts yellowish.

Length, 3.5 millimeters; width 1.75.

Type locality.—Sibuyan Island, Philippines.

Type in United States National Museum.

Described from a single female collected at the type locality.

Genus **LANGURIOMORPHA** novum

Head not retractile, transverse, moderately convex in front, slightly wider than pronotum, and deeply concave between the antennal tubercles, which are rather strongly developed and widely separated. Eyes divided (lobes connected by a narrow black band without facets) and widely separated on the top. Antennæ robust, 11-jointed, about as long as body, and clothed on underside with long stiff hairs; first joint moderately long, not cicatricose at apex, pedunculate, straight, and extending to about middle of pronotum; third joint shorter than first joint. Pronotum subcylindrical, armed at sides with a distinct tooth, disk unarmed and with transverse grooves. Elytra elongate, unarmed at base, and clothed with long erect stiff hairs. Legs moderately long; femora rather strongly clavate, and unarmed at tips; anterior tibiæ slightly arcuate, middle and posterior tibiæ straight and deeply emarginate on outer margin near apex; tarsi rather short, narrow, fourth joint about equal in length to joints 1 to 3 united; tarsal claws divaricate.

Genotype, *Languriomorpha bicolor* sp. nov.

This genus belongs to the tribe Acanthocinini, and is allied to *Phlyarus* Pascoe and *Camptomyne* Pascoe. From the former it differs in not having the elytra costate, and from *Camptomyne* by having two distinct sulci along the anterior and posterior margins of the pronotum. It can also be separated from both these genera by having the first antennal joint pedunculate. It also resembles *Oloessa* Pascoe in having the eyes divided and the first antennal joint pedunculate, but differs from it in having the pronotum armed at sides and the elytra unarmed at base. Superficially it resembles some of the beetles of the genus *Languria*, of the family Erotylidæ.

Languriomorpha bicolor sp. nov.

Female.—Elongate, subcylindrical, and shining; head and pronotum reddish brown; elytra dark bluish green; beneath reddish brown, abdomen more yellowish, legs dark brown, base of femora reddish yellow.

Head with an obsolete longitudinal groove extending from occiput to epistoma, the surface obsoletely punctate, very sparsely clothed with exceedingly short inconspicuous pubescence, and with a few long erect black hairs along eyes and behind epistoma; mandibles reddish brown, the tips black; palpi brownish yellow; eyes rather small, the lower lobes rounded and strongly convex, the upper lobes narrow and separated from each other on the top by half the distance that separates the lower lobes on the front. Antennæ reddish black; base of joints (except the first two) reddish yellow, sparsely clothed with short inconspicuous pubescence, and with long erect black hairs on underside of joints; first joint abruptly expanded at apex, but the swollen part somewhat flattened on underside; third joint slightly shorter than first joint, and only obsoletely shorter than fourth; following joints nearly subequal in length, and about two-thirds as long as fourth. Pronotum slightly longer than wide, apex and base equal in width; sides nearly parallel, feebly constricted near anterior and posterior angles, with a rather long slender tooth slightly behind middle, the tooth acute at tip and bent upward; surface moderately convex, with two narrow transverse grooves along anterior and posterior margins, smooth and glabrous, except for a few long erect hairs. Scutellum somewhat triangular, narrowly rounded at apex. Elytra distinctly wider than pronotum and obsoletely depressed on basal half; sides parallel to middle, then feebly arcuately attenuate to the tips, which are separately narrowly rounded; surface smooth, sparsely clothed with inconspicuous recumbent cinereous pubescence, and with rows of regularly placed long erect hairs. Beneath densely obsoletely punctate, rather densely clothed with short recumbent yellowish pubescence, and with a few longer erect hairs on the last three abdominal segments; last abdominal segment broadly rounded at apex.

Length, 4.75 millimeters; width, 1.4.

Type locality.—Sandakan, Borneo.

Type in United States National Museum.

Described from a single female collected at the type locality.

Emeopedus longicornis sp. nov.

Male.—Elongate, rather broad, and strongly depressed above; uniformly brownish black above, rather densely clothed with short recumbent brown pubescence and variegated with cinereous hairs; beneath brownish black, the abdomen reddish brown, the posterior margin of the segments yellowish.

Head quadrate and strongly convex in front, as wide as pronotum, strongly concave between the antennal tubercles, which are moderately long and widely separated; surface with a narrow longitudinal groove extending from occiput to epistoma, not distinctly punctate, and sparsely clothed with short recumbent cinereous pubescence; mandibles black; palpi brownish black; eyes rather large and very deeply emarginate, the lower lobes rounded and strongly convex, and the upper lobes narrow and widely separated on the top. Antennæ one and one-half times as long as body, slender, and sparsely clothed with short inconspicuous pubescence; first joint cylindrical, extending to basal third of pronotum, and three-fourths as long as third joint, which is subequal in length to fourth. Pronotum slightly wider than long, slightly narrower at base than apex, and widest at apical third; sides unarmed, arcuately rounded anteriorly, and more attenuate toward base; base and anterior margin transversely truncate; surface regularly convex, and rather densely coarsely punctate. Scutellum broadly rounded behind. Elytra distinctly wider than pronotum, sides parallel to near apical fourth, then arcuately attenuate to the tips, which are separately broadly rounded; surface coarsely densely punctate, the punctures denser and more irregularly placed in basal region, forming distinct rows toward sides and becoming more obsolete toward apex, the cinereous pubescence forming on each elytron a more or less distinct broad spot at basal fourth and a narrow zigzag fascia at apical fourth, behind which the surface is distinctly variegated. Beneath obsoletely punctate and sparsely clothed with short recumbent cinereous pubescence; last abdominal segment broadly subtruncate at apex; tibiæ nearly straight, the middle pair distinctly emarginate on outer margin.

Length, 4 millimeters; width, 1.5.

Type locality.—Sandakan, Borneo.

Type in United States National Museum; paratype in collection of C. F. Baker.

Described from two males collected at the type locality (*Baker 13506*).

DEUX MELASIDÆ NOUVEAUX DES PHILIPPINES

Par Ed. Fleutiaux
Nogent-sur-Marne, France

Bothrion praeustum sp. nov.

5 millimètres. Allongé, convexe, atténué. Dessus jaune-rougeâtre sur la moitié antérieure, noir sur la partie postérieure des élytres; pubescence de la couleur du fond. Tête convexe; ponctuation ombiliquée serrée. Antennes à deux premiers articles jaunes, les autres noirâtres; longuement pectinées à partie du 3^e^. Pronotum plus long que large, peu rétréci en avant, arrondi sur les côtés, regulièrement convexe; ponctuation ombiliquée serrée. Ecusson triangulaire, ponctué. Elytres atténués, striés-ponctués; interstries à ponctuation assez grosse. Dessous jaune. Sillons antennaires larges, profonds et lisses, à aretes vives. Fossette prosternale nette et profonde. Pattes jaune clair.

Ile Sibuyan (*Baker*).

Trés jolie espèce. Differe de *B. bakeri*, par sa forme atténuée en avant et en arriére; par sa couleur, et par la fossette prosternale plus grande.

Scython insulcatus sp. nov.

9.5 millimètres. Oblong, convexe. Dessus jaune-rougeâtre, avec la tête une tache en avant du pronotum et l'écusson noirs; pubescence jaune, obscure sur les parties noirs. Tête convexe, finement et peu densément ponctuée, impressionée en avant; base de l'epistom subégal à la crete sur antennaire, impressionée au milieu, bord antérieure sinué. Antennes noirs et longues, dépassant la moitié du corps, comprimis et fortement serriformes. Pronotum moins long que large, sinué sur les côtés, trés bombé, déprime à la base, ponctué comme la tête. Elytres graduellement arrondis latéralement, terminés par une épine, finement, éparsément et irregulierément ponctués, striés-sillonnés. Dessous noir; tout le propectus jaune, sauf le tour des hanches antérieures. Sillons antennaires nuls. Métasternum et abdomen finement pointillés; pubescence fine, grisâtre. Fémurs noirâtres; tibias plus ou moins rougeâtres; tarses plus clairs.

Ile Sibuyan (*Baker*).

Voisin de *S. nigriventris* Bonvouloir: moins robuste; ponctuation fine et espacée; une tache noir en avant du pronotum, jusque sur la bord antérieure; élytres entierèment jaunes.

Cette espèce est particulierèment curieuse par l'absence de sillons antennaires comme chez les Melasinæ; elle constitue sous ce rapport, avec certains *Plesiofornax* de Madagascar, une exception remarquable chez les Eucneminæ.

NOTES ON JAPANESE LEPIDOPTERA AND THEIR LARVÆ: PART IX

By A. E. WILEMAN
Fellow of the Entomological Society of London

ONE COLORED PLATE

HETEROCERA

GEOMETRIDÆ

BOARMIANÆ

Genus **EUCTENURAPTERYX** Warren

Euctenurapteryx WARREN, Novit. Zool. 1 (1894) 399.

Euctenurapteryx maculicaudaria Motschulsky.

Plate 1, fig. 1, larva; fig. 2, food plant.

Japanese name, *shirotsubame-edashaku, kiracho, ingaya no shakutori-chō.*

Acœna maculicaudaria MOTSCHULSKY, Bull. Soc. Nat. Mosc. 1 (1866) 196; (*Urapteryx*) PRYER, Trans. Asiat. Soc. Japan 12 (1884) 59; (*Euctenurapteryx*) LEECH, Ann. & Mag. Nat. Hist. VI 19 (1897) 193; (*Ourapteryx*) MATSUMURA, Cat. Insect. Jap. 1 (1905) 149, No. 1278; Thousand Insects of Japan (Zoku Nihon Senchū Zukai (Jap.) (1910) suppl. 2, 73, No. 383, pl. 23, fig. 8, ♀; (*Urapteryx*) NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] 14 (1910) 92, pl. 5, figs. 1–11, larva, pupa, imago ♂; SASAKI, Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 2, 9, pl. 80, larva, imago ♂.

Urapteryx luteiceps FELDER and ROGENHOFER, Reise Novara Lep. 5 (1875) pl. 122, fig. 2; STAUDINGER, Iris 10 (1897) 36; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 330, No. 3758.

The larva figured (Plate 1, fig. 1) was taken in May, 1901 (figured, May 31), on *inu-gaya* (*Cephalotaxus drupacea* Siebold and Zuccarini), at Yoshino, Yamato Province, Honshu. A male imago of *E. maculicaudaria* Motschulsky emerged from the pupa resulting from this larva on June 26, 1901. Three male and two female imagoes also emerged from similar larvæ taken at the same time and place. The pupa is inclosed in a frail, white cocoon. I describe the larva from my artist's original figure as follows:

Larva.—Length, 67 millimeters. Head greenish yellow, with two, slender, black streaks on each side. Color light green. A white, longitudinal, subdorsal stripe edged above and below with a slender, black line, the upper line ends at segment 13, the lower line curves down to the anal segment; above the upper black line is another, extending from segment 13 to the center of segment 9 where it apparently ceases. A spiracular white stripe, not edged with black lines, ending on anal segment; below this there is a black, slender, longitudinal, subspiracular line extending from the leg on segment 4 to the center of segment 11; legs black; prolegs and claspers light reddish brown; spiracles white, ringed with brown exteriorly.

Nagano[1] gives a life history of *E. maculicaudaria* Motschulsky, which I have translated into English, accompanied by figures and descriptions of the larva, pupa, and imago. He says:

> A larva taken at Gifu, Mino Province, in April, 1909, on ara-kashi [*Quercus glauca* Thunberg], spun its cocoon on May 10 and turned into a pupa on May 13. The imago emerged on May 29. Another larva taken at the end of April, 1909, on sangoju [*Viburnum odoratissimum* Ker.], pupated on May 3 and the imago emerged on May 19. An examination of the dates on which this moth is captured shows that it is also taken at Gifu in the middle of October and there are therefore probably two broods of the species in the year. It is not yet ascertained in which stage it passes the winter. The food plants are various species of kashi [evergreen oak]; enishida [*Cytisus scoparius* Link]; sangoju.

Nagano describes the larva as follows:

> Body ashy brown sprinkled with minute black specks, it closely resembles a withered twig. On each side of the head there is a black spot, on the anterior area of segment 3 to which one pair of thoracic legs is attached, there is a subdorsal wart, or projection. The shape of the larva exactly resembles that of a withered twig; there is a wart on segment 5 situated posteriorly and laterally; there are also some warts on the posterior part of each segment; the mediodorsal line is marked with spots shaped like a stirrup; on segment 3 there is a conspicuous, half-moon-shaped, white, mediodorsal spot; laterally some ridged warts or projections; each segment with horizontal skin folds; the abdominal legs adjoin the claspers, are basally ridged with black and have a few hairs; ventrally tinged with white; the supraventral line generally sparsely sprinkled with black dots; spiracles encircled with black; length 2 sun [about 66 millimeters].

Sasaki[2] gives figures and descriptions of the larva and male imago of *maculicaudaria*. He names the imago *kirachō* and *inugaya no shakutor-ichō* (the *inu-gaya* geometer). He says that—

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[1] Nawa's Insect World (Knochū Sekai) 14 (1910) 92, pl. 5, figs. 1–11.

[2] Nihon Jūmoku Gaichūhen (Jap.) ed. 3 (1910) pt. 2, 9, pl. 80, larva, imago ♂.

The larva appears in May and feeds upon the *inu-gaya* (*Cephalotaxus drupacea* Siebold and Zuccarini) which also goes by the names of *hebo-debo; hibi-gaya.* It is full grown between the end of May and the commencement of June and forms a cocoon of leaves rolled together. The imago emerges in the middle of June. The full-grown larva is green; length 1 sun [Japanese inch] 7 or 8 bu [about 56.1 to 59.4 millimeters]; dorsally of a light, bright color; ventrally dark colored; it is not easy to find as the color of the body resembles so closely the leaves of the *inu-gaya;* mandibles, thoracic and abdominal legs are all dark brown and there is a patch of the same color on the anal segment. The abdominal legs are attached to segments 9 and 12.

Judging from the descriptions of the larva of *maculicaudaria* Motschulsky given by Nagano and Sasaki, there are apparently two forms.

The form described by Nagano is "ashy brown, sprinkled with minute black specks;" it appears in April, feeds upon *Quercus, Viburnum,* and *Cytisus,* and the imago emerges in May. The form described by Sasaki is green, it appears in May and June, feeds upon *Cephalotaxus,* and the imago emerges in the middle of June. The larva figured by me agrees in color with the form figured and described by Sasaki. It was also taken on *Cephalotaxus drupacea* Siebold and Zuccarini in May, and the imago emerged in the middle of June. As remarked by Sasaki, the larva "is not easy to find as the color of its body resembles so closely the leaves of the *inu-gaya* [*Cephalotaxus*]." It is an example of procryptic colors[3] affording a general protective resemblance which Poulton defines as "concealment as a protection against enemies effected by colors which harmonize with the total artistic effects of the immediate environment."

Leech[4] remarks:

> Among the species in Pryer's collection is a remarkable female aberration from Yokohama, in which the usual white colour is replaced by pale greyish brown; the transverse lines are, in consequence of the ground-colour, indistinct, but they are more ferruginous in colour as also are the fringes and spots at angle of the secondaries.

This specimen, alluded to by Leech, and also by Pryor, is now in the British Museum collection.

Local distribution.—Honshu, Musashi Province, Yokohama (*Pryer*): Tokyo, September (*Wileman*): Shinano Province, Oiwake (*Pryer*): Echizen Province, Tsuruga (*Leech*): Sagami

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[3] Vide Wileman, Philip. Journ. Sci. § D 9 (1914) table 1, facing page 248.

[4] Ann. & Mag. Nat. Hist. VI 19 (1897) 193.

Province, Hakone, June (*Wileman*): Yamato Province, Yoshino, June, August, September (*Wileman*). Hokkaido, Oshima Province, Hakodate, August (*Leech*). Matsumura records the species from Hokkaido and Honshu.

Time of appearance.—Larva, April to June; imago, May, June, July?, August, September, October; double-brooded?

General distribution.—Eastern China; Japan (*Leech*). Korea; Manchuria; eastern Siberia, Ussuri (*Matsumura*).

Genus **CROCALLIS** Treitschke

Crocallis TREITSCHKE, Eur. Schmett. VI 1 (1827) 151.

Crocallis obliquaria Moore.

Plate 1, figs. 3 and 4, larva, light form, lateral and dorsal aspects; figs. 5 and 6, larva, dark form, lateral and dorsal aspects; fig. 7, food plant. Larva of forma *arida* Butler.

Japanese name, *eguritsuma-edashaku.*

Crocallis obliquaria MOORE, Proc. Zool. Soc. London (1867) 622; HAMPSON, Moths India 3 (1895) 232, fig. 125, ♂; (*Gonodontis*) STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 329, No. 3745; MATSUMURA, Cat. Insect. Jap. 1 (1905) 148, No. 1267; Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] suppl. 2, 87, No. 408, pl. 24, fig. 18, ♀.

Crocallis angularia MOORE, Proc. Zool. Soc. London (1867) 622.

Crocallis bivittaria MOORE, Proc. Zool. Soc. London (1867) 622.

Niphonissa arida BUTLER, Ann. & Mag. Nat. Hist. V 1 (1878) 394; Ill. Typ. Lep. Het. 3 (1879) 31, pl. 48, fig. 7, ♂; PRYER, Trans. Asiat. Soc. Japan 12 (1884) 60, No. 287; (*Crocallis*) LEECH, Ann. & Mag. Nat. Hist. VI 19 (1897) 222.

Crocallis bilinearia SWINHOE, Proc. Zool. Soc. London (1889) 423.

Crocallis heydena SWINHOE, Trans. Ent. Soc. London (1894) 203.

There are two forms of the larva, one light in color, the other dark.

Form 1 (*light form*).—Plate 1, figs. 3 and 4. The larva figured was taken in December, 1900 (figured, December 4), at Kobe, Settsu Province, Honshu, on carrot, Japanese name *ninjin* (*Daucus carota* Linnæus). From this form I reared two male imagoes of *arida* Butler on April 10 and 15, 1901.

Form 2 (*dark form*).—Plate 1, figs. 5 and 6. I have bred imagoes of *arida* from this form of the larva taken at Kobe which also feeds upon carrot.

I describe form 1 and form 2 of the larva from my artist's original figures as follows:

Form 1.—Length, 66 millimeters. Color laterally light ashy gray with a broad, blackish brown, mediodorsal stripe, attenuated at each segmental suture and broadened out to an angle at the center of each segment; slightly darker, paired, longitudinal, faint mediolateral lines; spiracles ashy gray encircled with black; all legs, prolegs, and claspers light ashy gray; ventrum dark; segment 13 is slightly humped.

Form 2.—Length, 66 millimeters. Color much darker, especially laterally; mediodorsal stripe not so clear and conspicuous.

Imago.—Hampson[5] remarks:

> * * * the outer margin may be hardly crenulate or strongly toothed; the ground-color much yellower with fuscous blotches; the antemedial line may be prominent or entirely obsolete and in typical *obliquaria* the postmedial line of the fore wing is straight and oblique from near the apex.

Crocallis obliquaria and *arida* are the only forms of this species found in Japan. The imago is to be taken in the winter months from November to March by beating the withered leaves still clinging to the two species of dwarf oaks, *ko-nara* (*Quercus glandulifera* Blume) and *kunugi* (*Quercus serrata* Thunberg).

I am inclined to think that carrot is not the true food plant of this species, but that it probably feeds upon dwarf oak in spring and summer. My larvæ were taken in December when the oak leaves have all withered and are still clinging in some numbers to the trees. The hibernating larvæ, therefore, would naturally be obliged to seek for low-growing plants as, at this time of the year, the leaves of not only the oaks but of all other trees, with the exception of the nondeciduous ones and conifers, have all withered and fallen. The type of *C. arida*, from Yokohama (*Jonas*), is in the British Museum collection.

Local distribution.—Honshu, Musashi Province, Yokohama (*Pryer*) : Tokyo, September, October (*Wileman*) : Shinano Province, Oiwake (*Leech*) : Karuizawa, August (*Wileman*) : Shimotsuke Province, Nikko, September (*Leech*) : Yamato Province, Yoshino, September, October (*Wileman*) : Settsu Province, Kobe, April, bred (*Wileman*). Hokkaido, Oshima Province, Hakodate, May (*Wileman*). Matsumura records the species from Honshu only.

Time of appearance.—Larva, November and December; imago, April, May, August to March. Probably two or perhaps three broods of the imago in the year.

General distribution.—India (northwestern Himalayas, Khasis); Japan (*Hampson*). Western China (*Leech*). Manchuria (*Matsumura*).

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[5] Moths India 3 (1895) 232.

Genus **PERCNIA** Guénée

Percnia GUÉNÉE, Phal. 2 (1857) 216.

Percnia giraffata Guénée.

Plate 1, fig. 8, larva.

Japanese names, *ō-gomadara-edashaku*[6] and *mamushi-bori*.

Abraxas giraffata GUÉNÉE, Phal. 2 (1857) 205; (*Perenia*) PRYER, Trans. Asiat. Soc. Japan 12 (1884) 72, No. 495; HAMPSON, Moths India 3 (1895) 309; LEECH, Ann. & Mag. Nat. Hist. VI 19 (1897) 456; MATSUMURA, Cat. Insect. Jap. 1 (1905) 142, No. 1218; MUKAIGAWA and NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] 15 (1911) 50, pl. 4, figs. 1–6, ova, larva, pupa, imago.

Rhyparia grandaria FELDER, Wien. Ent. Mo. (1862) 39; FELDER and ROGENHOFER, Reise Novara 5 (1875) pl. 129, fig. 28.

The larva figured (Plate 1, fig. 8) was taken in July, 1901 (figured, July 20), at Yoshino, Yamato Province, Honshu, on persimmon, Japanese name *kaki* (*Diospyros kaki* Linnæus). A female imago of *giraffata* Guénée emerged from the pupa resulting from this larva on July 29, 1901. I describe the larva of *giraffata* from my artist's original figure as follows:

Larva.—Length, about 65 millimeters. Head yellowish, speckled with minute white points, slightly hairy. Color light purplish gray. A conspicuous purplish black dorsal and subdorsal eyelike ocellus on each side of segment 4 (counting head as segment 1); this ocellus is intersected subdorsally by a yellowish, half-moon-shaped streak; an irregular lateral series of purplish black, slender lines, some longitudinal, others irregularly curved; a longitudinal, ochraceous brown, subspiracular stripe dotted with minute white specks; legs light ochraceous, with three black spots; prolegs, claspers, and anal flap ochraceous brown; spiracles purplish gray, ringed with black exteriorly. Mukaigawa[7] gives a description of the larva of *Percnia giraffata* Guénée, accompanied by figures of the ova, larva, pupa, and imago drawn by Nagano. He says that—

> The larva resembles a mamushi [Japanese viper], and it feeds upon kaki [persimmon, *Diospyros kaki* Linnæus]. It hangs down by a thread when alarmed and enters the earth in order to pupate. There are two broods in the year. Imagoes taken between the end of May and the commencement of June laid their eggs on the surface of persimmon leaves and hatched after the expiration of about two weeks. They entered the

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[6] Matsumura also gives the name *ō-gomadara-edashaku* to *Percnia felinaria* Guénée var. *formosana* Matsumura, Zoku Nihon Senchū Zukai (1910) suppl. 2, 112, No. 451, pl. 26, fig. 8, ♂.

[7] Nawa's Insect World (Konchū Sekai) 15 (1911) 50, pl. 4, figs. 1–6, ova, larva, pupa, imago.

earth between the commencement and middle of July and pupated. The imagoes emerged at the end of July when they laid eggs. These eggs hatched in three or four days and the larvæ were full-grown by the commencement and middle of September when they entered the earth and pupated. They passed the winter in the pupal stage and the imagoes emerged in the following year.

Mukaigawa describes the larva as follows:

> When full grown it measures in length 1 sun [Japanese inch], 8 or 9 bu [59.4 to 62 millimeters]. Head reddish brown, sprinkled with yellowish white specks; a broad, black, longitudinal, dorsal stripe; subdorsal stripe broadly yellowish brown, with irregular, slender, curved, blackish brown lines; laterally and ventrally black; ventrum medially light colored; laterally sprinkled with purplish white dots; a specially striking feature is that segments 3 and 4 are conspicuously enlarged; segment 3 has a dorsal and lateral black, elliptical spot and also another spot of the same color shaped like an eyebrow, both of which give the two spots an eyelike appearance; dorsally this eyelike spot is centered with black; a yellow spot connects both eye spots. The larva varies more or less as there are some of them which are entirely tinged with ashy, light green.

This larva is an example of the class of protective mimicry alluded to by Poulton under pseudaposematic colors.[8] He defines this as "an appearance which deceptively suggests something unpleasant or dangerous to an enemy." As has been observed by Mukaigawa, the larva has a certain resemblance to the *mamushi* (Japanese viper). This snakelike[9] resemblance of some larvæ has been referred to in the course of these papers in the cases of *Ophideres tyrannus* Guénée and *Theophila mandarina* Moore, which have terrifying eyelike spots; and of *Theophila falcigera* Butler, which suggests a cobralike serpent.

Local distribution.—Honshu, Fujisan (*Pryer*) : Yamato Province, Yoshino, June, July (*Wileman*) : Shimotsuke Province, Nikko, August (*Wileman*). Kyushu, Hyuga Province, Nakato, July (*Wileman*) : Higo Province, Iidasan, May, June (*Wileman*). Very common at light at Yoshino.

Time of appearance.—Two broods in the year. The cycle of existence is approximately as follows: First brood: Ovum, May and June; larva, May, June, and July; pupa, July; imago, July and August. Second brood: Ovum, August; larva, September; pupa, September, October to May; imago, May and June.

General distribution.—Sikhim; Burma (*Hampson*). Japan, central and western China (*Leech*).

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[8] Vide Wileman, Philip. Journ. Sci. § D 9 (1914) table 1, facing page 248.

[9] Philip. Journ. Sci. § D 10 (1915) 348–356.

Genus ARICHANNA Moore

Arichanna MOORE, Proc. Zool. Soc. London (1867) 658.

Arichanna fraterna Butler.

Plate 1, fig. 9, larva; fig. 10, food plant.

Japanese names, *kishita-edashaku, madara-kintabaga* (recte ? *kishitabaga*).

Rhyparia fraterna BUTLER, Ill. Typ. Lep. Het. 2 (1878) 53, pl. 37, fig. 9.

Arichanna melanaria LEECH (nec Linnæus), Ann. & Mag. Nat. Hist. VI 19 (1897) 436; STAUDINGER and REBEL, Cat. Lep. Pal. 1 (1901) 323, No. 3691 (part.); MATSUMURA, Cat. Insect. Jap. 1 (1905) 139, No. 1199 (part.); Thousand Insects of Japan [Zoku Nihon Senchū Zukai (Jap.)] (1910), suppl. 2, 114, No. 454, pl. 26, fig. 11, ♂ (part.); NAGANO, Nihon Rinshirui Hanron (Jap.) (1905) 231, pl. 10, fig. 12 (? part.); Nawa's Insect World [Konchū Sekai (Jap.)] 19 (1915) 226, pl. 11, larva, pupa, imago ♂ ♀ (part.); PROUT, Seitz's Macrolep. Faun. Pal. 4 (1914) 304, pl. 14, fig. *b*, ♂ (part.).

Icterodes fraterna PRYER, Trans. Asiat. Soc. Japan 12 (1884) 72.

The larva figured (Plate 1, fig. 9) was taken in April, 1901 (figured, April 30), at Nara, Yamato Province, on *basui-boku* (Latin name?). A female imago of *Arichanna fraterna* Butler emerged from the pupa resulting on May 23, 1901, and another male imago was bred on the same date from a larva taken at the same time and place.

The larvæ were very common, in a semigregarious state, at Nara in April, and the imago occurs there in abundance in May, when I beat it out of bushes in the woods in great numbers.

I have been unable to identify the Japanese name basui-boku, given to this shrub. It may be a name given locally at Nara. I believe that it is identical with *Pieris japonica* D. Don, known in Japan as *asebi* or *asebo*. *Pieris japonica* is given by Nagano as the food plant of *Arichanna melanaria* Linnæus[10] and *A. jaguararia* Guénée[11] so that the larvæ of these two species, which much resemble each other, apparently feed on the same food plant.

I describe the larva of *fraterna* Butler from my artist's original figure as follows:

Larva.—Length, about? 45 millimeters. Head ochraceous brown. Body light yellow, rather darker on the anal segment; a dark, longitudinal, mediodorsal line; a longitudinal, subdorsal series of minute black dots, two on each segment; an irregular series of mid-lateral, spiracular and subspiracular black dots; legs and prolegs light ochraceous brown.

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[10] Nawa's Insect World (Konchū Sekai) 19 (1915) 226.

[11] Nawa's Insect World (Konchū Sekai) 17 (1913) 133.

Arichanna fraterna Butler has hitherto been regarded as a synonym of the European species *Arichanna melanaria* Linnæus and is so treated in Staudinger's catalogue and also by Leech[12] and by Nagano.[13] Butler in his description of *fraterna*[14] says:

> Closely allied to *R. melanaria* of Europe, but half as large again, the primaries with the series of black spots more crowded together, leaving broad white bands between the basal, central and submarginal series: secondaries with the spots larger and therefore forming three well-defined series in addition to the discocellular spot. Expanse of wings 2 inches 1 line. Yokohama (Jonas and Pryer).

In the national collection at the Natural History Museum, South Kensington, *Arichanna fraterna* Butler is separated from *A. melanaria* Linnæus and is given specific rank. Of the former species there is a series of six males and five females, all of which come from various localities in Japan; namely, Oiwake, Hakone, Tokyo, and Yokohama. The series of *melanaria* consists of eleven males and six females, all European specimens. The series of these two species show the following differences:

Butler observes in his description of the male type, which probably was the only specimen he had before him, that *fraterna* is "half as large again" as *melanaria.* In Table 1 are recorded measurements taken from the series of the two species, showing the expanse of their wings.

TABLE 1.—*Expanse of wings of Arichanna fraterna and A. melanaria.*

Species.	Sex.	Maximum expanse.	Minimum expanse.
		mm.	*mm.*
Arichanna fraterna	Male	58	44
Do	Female	56	46
Arichanna melanaria	Male	48	42
Do	Female	50	42

Antennæ.—The antennæ of *fraterna* seem to be of a stouter build than those of *melanaria* in which the pectinations are slenderer.

Markings.—*Arichanna fraterna* has the general appearance of being more conspicuously and heavily marked than *melana-*

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[12] Ann. & Mag. Nat. Hist. VI 19 (1897) 436.

[13] Nawa's Insect World (Konchū Sekai) 19 (1915) 226.

[14] *Rhyparia fraterna,* Ill. Typ. Lep. Het. 2 (1878) 53, pl. 37, fig. 9.

ria. In *fraterna,* as Butler observes, the black spots of the forewings are more "crowded together," and they are also partially coalescent which is not the case in *melanaria;* in *melanaria* also these black spots are decidedly smaller. On the hind wings the maculation of *fraterna* is more or less connected, forming bands, in some cases very decided ones, whilst in *melanaria* the maculation is, as a rule, well separated. One female specimen of *fraterna* from Yokohama seems to come nearer to *melanaria* from Europe than any of the ten other specimens of the series and the maculation of both fore and hind wings more resembles that of *melanaria.*

Nagano gives an account of the life history of *Arichanna melanaria,* in the bibliography of which he includes *Icterodes fraterna* as a synonym. He doubtless refers to *Rhyparia fraterna* Butler. I am unable to say whether typical *melanaria* is taken in Japan, but am content to separate the two species provisionally in accordance with the arrangement in the British Museum until European and Japanese lepidopterists have thoroughly examined their respective affinities. This may involve an examination of the genitalia of the two species. Meanwhile, with a view of providing some material for future investigation, I give a translation made by me of parts of Nagano's article on *melanaria,* including a description of the larva which, no doubt, refers to that of *fraterna* Butler; also translations from several German authors of descriptions of the larva of *melanaria.*

DESCRIPTIONS FROM VARIOUS AUTHORS

DESCRIPTION OF LARVA FROM NAGANO[15]

Head yellowish brown emitting yellowish white hairs; eyes black; dorsal region pale purplish white; ventrum and anal region light yellowish brown; the whole body marked longitudinally and transversely with black and with black dots; the dorsal line is double and is, more or less, marked with a series of dotted lines; the subdorsal line is also double and some black dots are present between its two lines, one or two on each segment, the lateral line is also double marked with a row of dots; spiracles dark, tinged with blackish green; black dots behind the spiracles and also a black dot beneath them; a row of dots near the subspiracular line and a row of black spots on the same line; a row of dots and spots also on the supraventral line; the ventral line is double and between its two lines the area is a light yellow but not on the last segment; a row of transverse black dots on segment 12; legs and prolegs are both yellow; when full grown the larva measures 9 bu [29.7 millimeters].

[15] Nawa's Insect World (Konchū Sekai) **19** (1915) 226.

This species [*Arichanna melanaria* Linnæus] is single-brooded and the time of its appearance and the conditions of its life history almost agree with those of the *hyōmon-edashaku* [*Arichanna jaguararia* Guénée]. The larva is found in March and feeds upon the leaves of the *asebi, Pieris japonica* [D. Don). In Europe it is said to feed upon *kurosume no ki, Vaccinium uliginosum* [Linnæus]). Both of these shrubs belong to the order of *Ericaceæ* and *V. uliginosum* also occurs in Japan. If, therefore, careful search were made it might be discovered that the larva feeds upon *V. uliginosum* in Japan also. Moreover, as several genera allied to these two shrubs are rather numerous in Japan it may probably happen to feed upon others on which one would never expect to find it. It usually pupates between the end of April and the commencement of May and the imago emerges between the end of May and the commencement of June. The larva of this species is decimated in surprising numbers by the attacks of parasitic flies, which is also the case as regards the *hyōmon-edashaku.* The annual cycle of its metamorphoses is not yet known but, as larvæ which have grown to about 3 bu [9.9 millimeters] in length may be seen at the end of March, I think that it probably hibernates in the larval stage.

DESCRIPTION OF LARVA OF RHYPARIA MELANARIA FROM HOFMANN [16]

Larva 2.5 centimeters long, black with double, yellow, medial- and double, yellow collateral lines; on the fifth to the eighth segment the collateral lines are in many specimens quite, or almost quite, interrupted, thus producing large deep black spots on both sides of the medial line.—Cervical plate black, divided from the medial line edged broadly white in front. Head bright chestnut color, unmarked, narrower than the first segment slightly notched on the vertex. Anal flap obtusely triangular, black. Tubercles very small, not visible without magnification. Spiracular lines very broad, light yellow, traversed by two interrupted and waved, slender, black lines. Spiracles large, black, rusty yellow; on the three last segments, especially, very conspicuous spots and three large black dots surrounded by very small tubercles. Ventrum traversed by a broad, light yellow, medial line and on both sides by two side lines, of which the interior one is reddish yellow and broad, the exterior one pale yellow and slender; between the latter and the spiracular stripe another indistinct, interrupted, yellow, longitudinal line; all feet red-brown. Lives in May on the marsh bilberry (*Vaccinium uliginosum*) and pupates in the earth without spinning a cocoon into a brownish yellow pupa. (Wild. 378, pl. 10, fig. 4.) Emerges in July. Distributed in several regions of northern Germany, in the Alps, in southern France, Sweden, Lapland, Russia, and Siberia.

DESCRIPTION OF LARVA OF ARICHANNA MELANARIA FROM REBEL [17]

The larva yellow, with numerous (8) waved black longitudinal lines, which thicken into stripes above the margin of the sides which are spotted with orange-yellow. Head and thoracic legs bright brown. Lives in May on the marsh bilberry (*Vaccinium uliginosum*). The pupa brownish yellow, with conical cremaster, which ends in two spines.

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[16] Die Raupen der Grossen Schmetterlinge Europas (1893) 178, pl. 40, fig. 16*a*.

[17] Berge's Schmetterlingsbuch, ed. 9 (1910) 383, pl. 40, fig. 14, imago ♂ (no figure of larva).

DESCRIPTION OF LARVA OF ARICHANNA MELANARIA FROM HOFMANN[18]

The larva, plate 40, fig. 16, with bright brown head, is yellow with numerous black, waved longitudinal lines, which thicken into stripes above the margin of the sides which is bright and spotted with orange-yellow. Lives in May on the marsh bilberry (*Vaccinium uliginosum*).

Nagano,[19] in his introductory remarks concerning *Arichanna melanaria* L., says that—

> * * * this species much resembles, both in form and habits, the closely allied species *Arichanna jaguararia* Guénée, the larva of which also feeds upon the same food plant as *melanaria;* namely, *Pieris japonica* D. Don, known in Japan as *asebi* or *asebo.*

This being so, I think that it may possibly be of some use for future investigation if I give here a translation of Nagano's description of the larva of *jaguararia* which, however, is a quite distinct species.

LARVA OF ARICHANNA JAGUARARIA GUÉNÉE; JAPANESE NAME, HYŌMON-EDASHAKU

Head yellowish brown emitting black hairs; eyes black; body yellow, slightly tinged with brown; dorsal line pale brown, indistinct; subdorsal line with a few, small, black dots on each segment; lateral line, with one or two black dots, or black spots, on each segment; the subspiracular line is also marked with one black dot on each segment; the size of these black dots, or spots, varies more or less according to the larva and sometimes they are absent; some larvæ also are well marked on the whole body with black spots whilst others are sparsely marked; spiracles black encircled with black; the supraventral line also has a small black dot on each segment; the spots on segments 4 and 5 are the largest, they are however sometimes indistinct; tips of thoracic legs dark brown; the base marked externally with a black spot; also the base of these legs is marked internally with a deep brown line; when full grown the larva attains a length of 1 sun [Japanese inch] and 2 bu [39.6 millimeters].

* * * *jaguararia* has one brood in the year. The larva may be seen in March. It feeds upon *asebi* (*Pieris japonica* D. Don). It generally pupates at the commencement of May, and the imago emerges at the commencement of June. The larva is to be seen in great numbers from the middle to the end of April on the leaves of the *asebi.* A great number of them are subject to the attacks of a parasite and, therefore, very few of them reach the pupal stage, whilst those which attain the imago stage are still scarcer. The parasite lays its eggs on the external surface of the larva. These eggs are almost silvery white in color. They are sometimes deposited by the parasite at the anal extremity of the larva, but more generally on the thoracic segments. The larvæ examined

by me were infested with at least one egg of the parasite and in many cases with five eggs. I have taken some scores of these larvæ annually for some years past and have reared them but they have all died, either previous to pupation or during the pupal stage, owing to the injury inflicted upon them by these parasites, and I have scarcely ever been able to obtain any imagoes from them. Dating from the year before last up to last year [1912] I have reared young larvæ which were not, so far, infested by the eggs of these parasites and have only succeeded in rearing one imago from the whole number. From this experience I have learned that the proportion of imagoes of this species which emerges from the larva probably does not exceed one in a hundred. The number of females bred is also much less in comparison with the number of males. As, for the foregoing reasons, I have never been able to obtain eggs, I have never been able to trace the life history satisfactorily. I had larvæ at the end of March which measured about 3 bu [9.9 millimeters] in length, and I infer from this that the species probably passes the winter in the larval stage. The pupal stage lasts from the beginning of May to the beginning of June; the imaginal stage, from the beginning of June to the middle of July.

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[18] Die Schmetterlinge Europas, ed. Spuler 2 (1903–1910) 87, pl. 58, fig. 31, imago ♂; 4 (1910) pl. 40, fig. 16*a*, larva, fig. 16*b*, pupa.

[19] Nawa's Insect World (Konchū Sekai) 17 (1913) 133, pl. 8 (larva, pupa, imago ♂).

General distribution of Arichanna jaguararia.—Japan (Honshu, Shikoku, Kyushu); central and northern China.

Pupa of Arichanna fraterna Butler.—Light shining brown, lighter in color on the wing cases.

Imago.—Leech remarks:

> *Fraterna*, Butl., is a pale form of *A. melanaria*, and is almost exactly identical with some European examples of the species in my collection. *Sordida*, Butl., is a dark form also agreeing with some European specimens, and *askoldinaria* is a form intermediate between the two. Alphéraky mentions a variety of the species from Peï-chouï (Rom. sur. Lép. vi. p. 55).

As previously remarked by me *Arichanna* (*Rhyparia*) *fraterna* Butler is now separated from *Arichanna melanaria* in the British Museum collection and is given specific rank. *Arichanna* (*Icterodes*) *sordida* Butler[20] is now included as a synonym in the series of *Arichanna* (*Rhyparia*) *askoldinaria* Oberthür,[21] which is also given specific rank.

The type of *Rhyparia askoldinaria* is from Korea. The type of *Icterodes sordida,* a female, is from western Korea.

Local distribution of Arichanna fraterna.—Honshu, Shinano Province, Oiwake (*Pryer*): Musashi Province, Yokohama (*Pryer*): Yamato Province, Yoshino and Nara, May, June (*Wileman*): Sagami Province, Hakone, June (*Wileman*): Shimotsuke Province, Nikko, July (*Wileman*): Mino Province Gifu (*Nawa*) (as *melanaria*). Very common at Yoshino and Nara, Yamato Province, in June. Matsumura records *mela-*

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[20] *Icterodes sordida* Butler, Ann. & Mag. Nat. Hist. V 11 (1883) 116.

[21] *Rhyparia askoldinaria* Oberthür, Etud. d'Ent. 5 (1880) 52, pl. 9, fig. 11.

naria from Hokkaido, Honshu, and Kyushu, with *fraterna* as synonym. Nagano records *melanaria* from Shikoku with *fraterna* as synonym.

Time of appearance.—Arichanna fraterna, larva, April; imago, May to July.

General distribution of Arichanna melanaria.—Europe; Korea; eastern Siberia (Ussuri, Amurland, Askold) (*Leech*); Manchuria (*Matsumura*); China (*Alphéraky*).

General distribution of Arichanna fraterna.—Japan.

ILLUSTRATIONS

[Drawings by Hisashi Kaidō.]

PLATE 1

FIGS. 1 and 2. *Euctenurapteryx maculicaudaria* Motschulsky. *1,* larva; *2,* food plant.

3 to 7. *Crocallis obliquaria* Moore forma *arida* Butler. *3* and *4,* larva, light form, lateral and dorsal aspects; *5* and *6,* larva, dark form, lateral and dorsal aspects; *7,* food plant.

FIG. 8. *Percnia giraffata* Guénée, larva.

FIGS. 9 and 10. *Arichanna fraterna* Butler. *9,* larva; *10,* food plant.

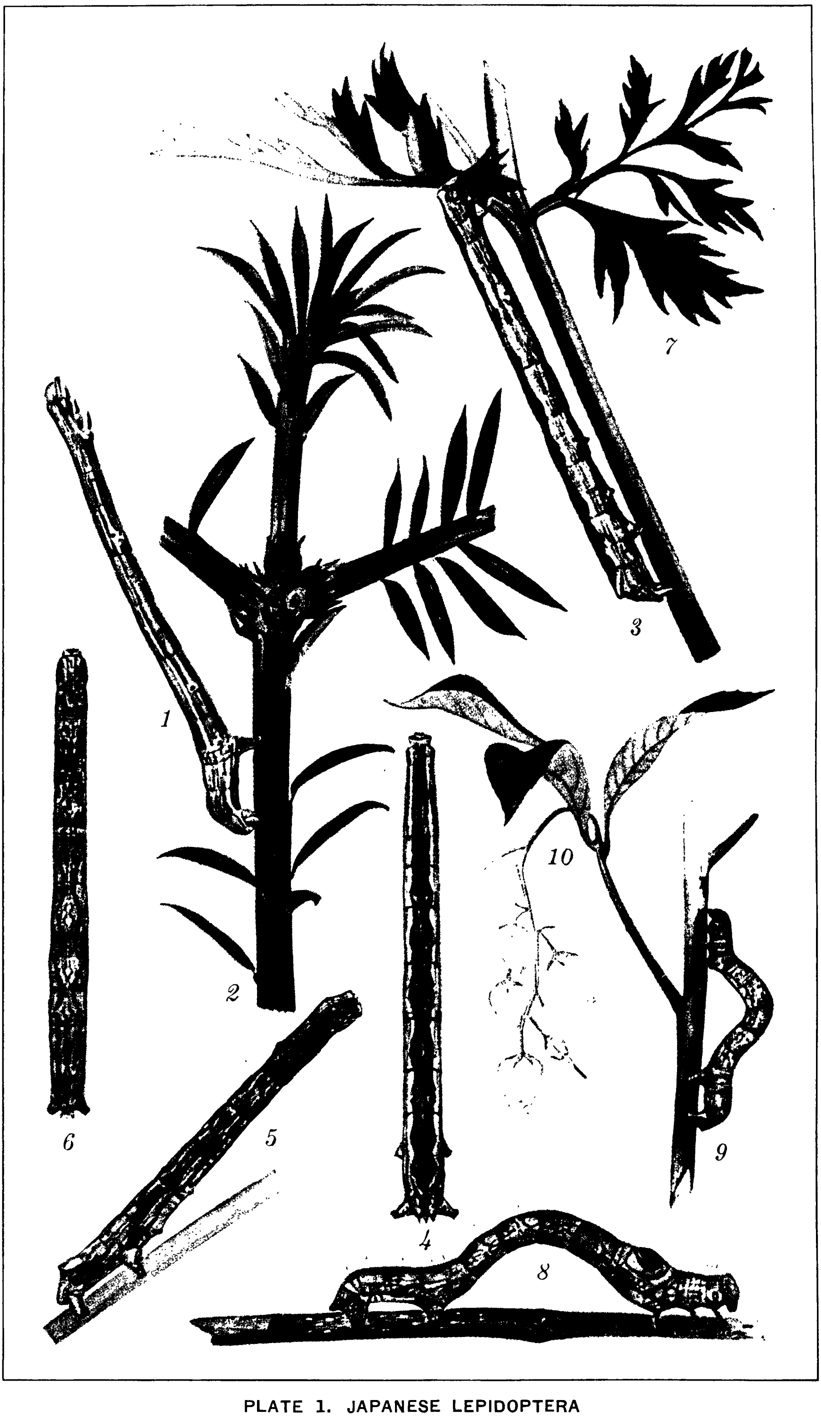

PLATE 1. JAPANESE LEPIDOPTERA

UNIV. OF MICH.

DRITTER BEITRAG ZUR KENNTNIS DER LYCIDÆ

DIE NEUE GATTUNG LEPTOTRICHALUS

Von R. Kleine
Stettin, Prussia

ZWEI TAFELN

VORBEMERKUNG

Die Zahl der bekannten Lyciden ist beträchtlich, namentlich Bourgeois und Waterhouse haben zahlreiche Arten beschrieben. Was die systematischen Studien dieser interessanten Familie erschwert ist das gänzliche Fehlen zusammenhängender Arbeiten.

Bei meinen Studien habe ich die Erfahrung gemacht dass die artliche Festlegung zuweilen auf grosse Schwierigkeiten stösst. Nicht nur die Ausfärbung ist grossen Schwankungen unterworfen, auch habituelle Einzelheiten, namentlich an Fühlern, Prothorax, und Elytren sind nicht so konstant, dass damit difficile Arten zu trennen wären. Ich bin daher dazu übergegangen den Penis in ausgedehntestem Umfange zur Arttrennung heranzuziehen. Dies Verfahren hat sich als allein gebrauchsfähig erwiesen und ist in der nachstehenden Arbeit zur Anwendung gekommen.

Für die Bearbeitung neuer Arten wird damit jede Unklarheit vermieden; schwieriger ist es die schon beschriebenen Arten älterer Autoren zu deuten. Handelt es sich um markante Formen, so wird es noch möglich sein, eine sichere Feststellung vorzunehmen; bei sehr ähnlichen Arten indessen wird es, sobald nahestehende Formen gefunden sind, schwer werden zu sagen ob die angenommene Art mit der des Autors übereinstimmt. Auf jeden Fall wird alles versucht werden Klarheit zu schaffen. Es sollte keine Art ohne Abbildung wichtiger Organe oder Organteile publiziert werden, weil sich geringe, aber konstante Unterschiede oftmals garnicht durch Worte wiedergeben lassen.

Bei den hier besprochenen Arten besteht nur Aehnlichkeit zwischen *cyaneiventris* Waterhouse und *dubitabilis* sp. nov. Ich habe die Arten so getrennt, dass ich die am weitaus häufigste und verbreitetste als die Waterhouse'sche angesprochen habe.

Im allgemeinen bin ich meinem Grundsatz, keine neue Art ohne den Mann festzulegen, treu geblieben. Nur in einem Falle glaubte ich eine Ausnahme machen zu können, da die Arten hinreichend verschieden waren.

Nur zwei Arten, die bisher bei *Trichalus* standen, sind bekannt gewesen; neunzehn habe ich neu beschrieben. Nicht weniger als vierzehn sind von den Philippinen und ich bin Herrn Prof. Charles Fuller Baker für seine dauernde Unterstützung sehr zum Dank verpflichtet.

AELTERE ARTEN

Bis zur Begründung der Gattung sind beschrieben worden: von Kirsch, *cyaniventris;*[1] von Waterhouse, *cyaneiventris* Illiger.[2]

Beide Arten gehören sicher zu *Leptotrichalus.* Ich konnte mich nicht davon überzeugen dass noch andere *Trichalus*-Arten in die Gattung zu übernehmen sind. Bei *Metriorrhynchus* können sich, schon wegen der verkürzten ersten Rippe der Elytren, keine *Leptotrichalus*-Arten finden.

Genus **LEPTOTRICHALUS**[3] novum

Von der Gestalt eines *Metriorrhynchus.* Kopf mit freier, meist etwas ausgehöhlter Stirn, Rüssel in wechselnder Länge vorhanden, immer aber stumpfer und robuster als bei *Metriorrhynchus.* Fühler lang, bis ins hintere Drittel der Elytren reichend, erstes Glied keulig, zweites sehr klein, im ersten verborgen, die folgenden viel länger als breit, schwach gezähnt, vom dritten bis zum zehnten an Länge, aber wenig an Breite abnehmend, das elfte schmal, lang, elliptisch. Prothorax trapezoid, Vorderrand schmal, Seiten flach geschwungen, Hinterrand wellig, Aussenecken meist spitz, nur eine sehr schmale, mittlere Areole, die den Hinterrand immer, den Vorderrand oft verbindet oder durch einen ganz kurzen undeutlichen Kiel verbunden ist. Hinter der Mitte zuweilen quere Aufwölbungen als kleine Rippen. Schildchen viereckig, Hinterrand mehr oder weniger halbkreisförmig ausgebuchtet. Elytren ähnlich *Trichalus,* erste Rippe nur im basalen Drittel, zweite im hinteren Drittel ganz fehlend oder nur obsolet, dritte und vierte bis dicht an den Deckenrand gehend, Furchen breit, gegittert, Gitterung durch eine flache Rippe getrennt, oder die Rippen fehlend, die Figuren der Gitterung verschieden. Beine schlank, normal, Trochanteren scharf dreieckig. Abdomen normal. Hautflügel, Tafel 1, Fig. 1 und 2.

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[1] Mitt. Zool. Mus. Dresden 1 (1875) 35 (als *Metriorrhynchus*).

[2] Typ. Spec. Col. I, Lycidae (1879) 72, t. XVII, f. 6 (als *Trichalus*).

[3] *ηεπτος* schlank, *Trichalus* gen. Lycid.

Typus der Gattung, *Metriorrhynchus cyaniventris* Kirsch.

In Habitus ist *Leptotrichalus* mehr *Metriorrhynchus* nahestehend als *Trichalus*. Die Neigung das Untergesicht zum Rüssel zu verlängern spricht auch dafür. Alle anderen Merkmale sprechen dagegen für Anlehnung an *Trichalus*. Der Prothorax hat nur eine Areole und der Rippenverlauf auf den Elytren ist *Trichalus* sehr ähnlich, wenn er sich auch nicht direkt deckt. Die Gattungen mit verkürzter erste Rippe sind in eine eigene Verwandtschaft zu bringen.

Für die Gattung typisch ist der lange, trapezoide Prothorax und die auffallend langen Fühler, die den anderen, nahestehenden Gattungen fehlen.

ZERLEGUNG DER GATTUNG IN SYSTEMATISCHE GRUPPEN

Der Versuch die Gattung in kleine, in sich abgeschlossene Gruppen zu zerlegen ist missglückt. Der Habitus ist so in sich abgeschlossen, dass keine Gruppierung der Arten möglich war. Auffallend ist die gänzliche Systemlosigkeit der Penisbildung. Während manche Gattungen der Lycidæ deutliche Verwandtschaft im Penisbau erkennen lassen und dadurch eine natürliche Gruppierung ermöglichen, herrscht hier völlige Regellosigkeit. Ich habe daher, aus rein praktischen Gründen, die Zusamenstellung nach der Körperfarbe vorgenommen.

GEOGRAPHISCHE VERBREITUNG

Die Gattung ist rein indo-malayisch; vierzehn von den einundzwanzig Arten sind auf den Philippinen endemisch. Auf Celebes fand ich zwei Arten vor, weiter nach Süden und Südosten scheint die Gattung nicht vorgedrungen zu sein. Von den Molukken, Neu-Guinea, und Australien sah ich keine Belegstücke. Die Berührungspunkte mit *Trichalus* sind an den verschiedensten Stellen vorhanden, doch scheint mir das Hauptverbreitungsgebiet von *Trichalus* mehr austro-malayisch zu sein.

Ganz auffällig gering ist der Artbestand auf Borneo. Es mag das seinen Grund darin haben, dass wir noch zu wenig über die Fauna der Insel wissen. Bisher habe ich nur den weitverbreiteten *cyaniventris* Kirsch von dort gesehen. Java und Sumatra haben je zwei neue Arten gebracht, in Malakka ist noch *cyaniventris* gefunden worden, hier scheint die Westgrenze erreicht zu sein. Im allgemeinen scheinen die *Leptotrichalus*-Arten eine enge Verbreitung zu haben. Nur auf den Philippinen kommen vor:

Leptotrichalus cereus sp. nov.
Leptotrichalus celsus sp. nov.

Leptotrichalus dubitabilis sp. nov.
Leptotrichalus acidus sp nov.
Leptotrichalus acutus sp. nov.
Leptotrichalus accuratus sp. nov.
Leptotrichalus acerbus sp. nov.
Leptotrichalus adolescens sp. nov.
Leptotrichalus effeminatus sp. nov.
Leptotrichalus circumscriptus sp. nov.
Leptotrichalus cicatricosus sp. nov.
Leptotrichalus adjunctus sp. nov.
Leptotrichalus admirabilis sp. nov.
Leptotrichalus cyaneiventris (Waterhouse).

Mit Ausnahme des nördlichsten Teiles ist die ganze Inselgruppe bewohnt.

Die einzige von Borneo bekannte Art ist noch in Sandakan gefunden worden, scheint aber nicht mehr nach Palawan vorgedrungen zu sein; es wäre interessant zu erfahren wo die Ostgrenze liegt.

Die javanischen Arten *conciliatus* und *concinnus* waren beide aus dem Preanger. Die Sumatraner sind noch zu unklar, *completus* sah ich nur von der Insel Bali, *adversarius* war ohne näheren Fundort.

Auf Celebes kommen *acclinus* und *accomodatus* vor.

Bestimmungstabelle der Leptotrichalus-Arten.

1. Oberseite des Körpers einfarbig rotorange bis lehmgelb, Elytren ohne schwarze Färbung im Spitzenteil .... 2.[4]

Oberseite des Körpers ganz schwarz oder wenigstens die Elytren im Spitzenteil mehr oder weniger schwarz oder graubraun .... 9.

2. Penis vorn hakenförmig umgebogen .... **L. conciliatus sp. nov.**

Penis vorn nicht umgebogen .... 3.

3. Penis vorn verbreitert, Präputialteil lang elliptisch, breiter als der Stiel und deutlich von diesem abgesetzt .... **L. cyaneiventris (Waterhouse).**

Penis von verschiedener Gestalt, vorn aber nicht erweitert .... 4.

4. Penis vorn keulig verdickt .... 5.

Penis vorn nicht keulig verdickt .... 6.

5. Präputium auf der Unterseite mit einer halbelliptischen Vertiefung. **L. acclinus sp. nov.**

Präputium mit drei deutlichen, hyalinen, vertieften Stellen. **L. celsus sp. nov.**

6. Penis vor dem erweiterten Präputium taillenartig verengt. **L. accuratus sp. nov.**

Penis vorn spitz zulaufend .... 7.

7. Penis mit sehr grossem Präputialteil und langer, dornartiger Einlage. **L. dubitabilis sp. nov.**

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[4] Arten mit gelben und mehr oder weniger schwarzen Elytren (Farbendimorphie) sind in beiden Abteilungen aufgeführt.

Penis lang elliptisch, sehr spitz, in Seitenansicht keine dornartige Einlage .... 8.

8. Penis beiderseits lang elliptisch zugespitzt .... **L. cereus** sp. nov.
Penis mehr lineal, Seiten wellig gebogen .... **L. adversarius** sp. nov.

9. Einfarbig schwarze Arten .... 10.
Nur zum Teil und dann nur auf den Elytren schwarz oder dunkel.... 12.

10. Penis mit spitzem Präputium .... **L. acidus** sp. nov.
Penis mit keuligem Präputium .... 11.

11. Seiten des Präputiums mit hellen, durchsichtigen Stellen. **L. acutus** sp. nov.
Präputium nur an der Spitze aufgehellt .... **L. cyaniventris** (Kirsch).

12. Es ist nur der Prothorax ganz oder zum Teil gelb, Elytren schwarz, ganz selten ist auch die Basis in geringer Ausdehnung gelb .... 13.
Die dunklen Partieen auf den Elytren liegen immer im Spitzenteil und nehmen selten mehr als die Hälfte des Organes ein .... 15.

13. Penis hinter dem Präputium taillenartig verengt.... **L. accuratus** sp. nov.
Nicht taillenartig verengt .... 14.

14. Penis lanzettlich, unterseits ohne blattartige Anhänge. **L. accomodatus** sp. nov.
Penis filiform, Präputium etwas erweitert, Unterseits mit blattartigen Anhängen .... **L. acerbus** sp. nov.

15. Die Elytrenspitze ist nur hellbraun angedunkelt .... 16.
Die Elytrenspitze ist dunkelbraun bis schwärzlich .... 17.

16. Penis mit hakenartigem Präputium .... **L. completus** sp. nov.
Penis mit linealen Anhängen am Präputium .... **L. adolescens** sp. nov.

17. Elytren mit Ausnahme des Spitzenteils ziegelrot, Schildchen schwarz. **L. concinnus** sp. nov.
Elytren lehmgelb, Schildchen nicht schwarz .... 18.

18. Erste und zweite Rippe stark verkürzt, dritte auffallend erhöht. **L. circumscriptus** sp. nov.
Nur die erste Rippe verkürzt, alle anderen normal und nicht auffällig erhöht .... 19.

19. Präputium nicht keulig verdickt .... **L. effeminatus** sp. nov.
Präputium keulig verdickt .... 20.

20. Penis vor dem erweiterten Präputium zungenförmig, schmal. **L. cicatricosus** sp. nov.
Nicht zungenförmig schmal .... 21.

21. Präputium seitlich mit hyalinen Stellen .... **L. adjunctus** sp. nov.
Ohne hyaline Stellen, unterseits mit saugnapfartigen Platten. **L. admirabilis** sp. nov.

Leptotrichalus conciliatus sp. nov. Tafel 1, Fig. 3.

Die ganze Unterseite des Körpers, Kopf, Fühler, Beine, zuweilen auch das Schildchen schwarz, mit schwachem, metallischem Anflug, Fühler mit Neigung zu dunkler Braunfärbung, Prothorax und Elytren, meist auch das Schildchen dunkel, schmutzig-ziegelrot. Hinterecken des Prothorax spitz vorgezogen, Areolen vorn und hinten offen. Erste Rippe der Elytren sehr kurz, zweite kaum bis zur Mitte reichend, Rippenbildung gleich *completus* aber allgemein robuster und verschwommener.

Länge, 9 bis 14 Millimeter; Breite (hum.), 2.5 bis 3.

Java. G. Tjerimai, ruhender Vulkan an der Nordküste, Preanger, X–XII–I (*Drescher*). Typen in der Sammlung Drescher und in meinem Besitz. Zwei Männchen, 5 Weibchen.

Mit *completus* nahe verwandt, auch dasselbe Begattungsorgan ist beiden Arten eigen. Ich halte beide Arten für gut und sicher getrennt, sie sind nicht nur durch die ganz andere Ausfärbung sondern auch durch den Fühlerbau und den spitz vorgezogenen Prothorax unterschieden. Die Variation der roten Farbenpartieen ist gering und neigt zur Braunfärbung. Wahrscheinlich ist *completus* eine insulare Vicariante.

Leptotrichalus acclinus sp. nov. Tafel 1, Fig. 4; Tafel 2, Fig. 1.

Prothorax, Schildchen, Elytren, Prosternum, Mesosternum, und die Schenkelbasis der Vorder- und Mittelbeine hell lehmgelb, sonst schwarz, Abdomen immer, Sternum zuweilen blaumetallisch glänzend. Areole des Prothorax hinten offen, mit dem Vorderrande durch einen kurzen, flachen Kiel verbunden, hinter der Mitte mit flachen Querwülsten. Schildchen tief halbkreisförmig eingebuchtet, erste Rippe nur im basalen Drittel, zweite bis weit gegen den Deckenrand reichend aber kürzer als die dritte Rippe, Gitterung durch eine schmale Rippe getrennt, Gestalt der Gitter immer rechteckig, meist genau gegenüberliegend, Rippen und Gitterung dicht behaart. Unterseite des Körpers zerstreut, hell und anliegend behaart.

Weibchen durch die etwas kurzen, aber gleichgestalteten Fühler in üblicher Weise durch das anders gebaute Abdomen gekennzeichnet.

Länge, 11 bis 16 Millimeter; Breite (hum.), 2 bis 3.5.

Süd-Celebes, Patunuang (*Fruhstorfer*). Ost-Celebes, Tomboegae Bonthain (*Ribbe*). Typen im Dresdener Museum und in meinem Besitz.

Leptotrichalus cyaneiventris (Waterhouse). Tafel 1, Fig. 5; Tafel 2, Fig. 2.

Trichalus cyaneiventris ILLIGER, Typ. Spec. Col. I, Lycidæ (1879) 72, t. XVII, f. 6.

Philippinen: Baguio, Provinz Benguet, Luzon; Butuan, Mindanao; Mount Maquiling, Provinz Laguna, Luzon; Nordwestliches Panay; Zamboanga, Mindanao; Davao, Mindanao; Kolambugan, Mindanao.

Die Variation ist so gross wie bei *dubitabilis*, zwischen orangerot und lehmgelb schwankend. Von Kolambugan sah ich nur orangerote Stücke; die Zugehörigkeit zur Art ist durch Penisautopsie gesichert.

Leptotrichalus celsus sp. nov. Tafel 2, Fig. 3.

Von *accuratus* äusserlich nicht zu unterscheiden, durch die Gestalt des Penis verschieden.

Länge, 9 Millimeter; Breite (hum.), 2.

Philippinen; Surigao, Mindanao (*Baker*). Typus in meiner Sammlung.

Leptotrichalus cereus sp. nov. Tafel 2, Fig. 4.

Gleichfalls mit *accuratus* verwandt und äusserlich nicht zu trennen. Durch den Penis sicher zu unterscheiden.

Länge, 9 Millimeter; Breite (hum.), circa 2.

Philippinen: Butuan, Mindanao; Surigao, Mindanao; Kolambugan, Mindanao (*Baker*), 4 Männchen.

Die Untersuchung diese Materials hat klar gezeigt, dass der ganze sich um *cyaneiventris* scharende Verwandtschaftskreis nur durch Untersuchung des Begattungsorganes feststellen lässt. Habituelle, äussere Unterschiede waren trotz eingehender Untersuchung nicht festzustellen. Die weiblichen Tiere waren nicht zu trennen. Die Verwandtschaftsverhältnisse sind bei den Lyciden viel komplizierter als die älteren Autoren angenommen haben.

Leptotrichalus adversarius sp. nov. Tafel 2, Fig. 5 und 6.

Erdbraun, Elytren, aber nicht das Schildchen, schmutzigziegelrot, Elytren matt, sonst schwach glänzend. Fühler lang, schlank, zweites Glied ringförmig, nicht im ersten verborgen, vom dritten ab einzeln, lang behaart. Areole des Prothorax lang, schmal, den Vorder- und Hinterrand berührend, Punktierung am Vorder- und Seitenrand schwach, Behaarung dicht, Erste Rippe auf den Elytren sehr kurz, zweite auf der Mitte schwach werdend, an der Basis und gegen den Hinterrand deutlicher, aber immer schwächer als die übrigen, Sekundärrippen schwach, undeutlich, Gitterung aus unregelmässigen Figuren bestehend, Behaarung kurz, dicht. Beine sehr schlank. Unterseite des Körpers ganz allgemein kurz und dicht behaart. Penis von robuster, gedrungener Gestalt, stark hyalin.

Länge, 8.5 Millimeter; Breite (hum.), 2.

Sumatra. Typus im Dahlemer Museum.

Eine gewisse Aehnlichkeit besteht mit *accuratus,* bei dem zuweilen ebenfalls eine Verdunkelung des Prothorax und Schildchens eintritt. Die Grundfarbe ist bei jener Art aber kein rot, sondern ein reines, helles lehmgelb. Ferner sind die Schenkel nicht an der Basis aufgehellt. Auf jeden Fall trennt die Form des Penis sehr leicht und beseitigt jeden Zweifel.

Leptotrichalus dubitabilis sp. nov. Tafel 1, Fig. 6; Tafel 2, Fig. 7.

Habituel von *cyaneiventris* (Waterhouse) nicht zu trennen, nur durch den gänzlich anders gebauten Penis leicht zu unterscheiden. Einen gewissen Anhalt gewährt die Unterseite des Körpers insofern als die Vorderbrust, die Coxen der Vorder- und Mittelbeine, und zuweilen auch die Schenkelbasis hellgelb ist, das ist bei *cyaneiventris* meist nicht der Fall, kommt aber vor, das Merkmal hat also nur bedingten Wert.

Länge, 9 bis 15 Millimeter; Breite (hum.), 2 bis 3.25.

Philippinen: Sibuyan; Mount Maquiling, Luzon; Cuernos Gebirge, Negros; Polillo (*Baker*); Iligan, Butuan, Kolambugan, Zamboanga, Surigao, und Dapitan, Mindanao; Nordwestliches Panay; Nueva Vizcaya; Basilan; Baguio, Benguet. Typen in meinem Besitz. Neunzehn Exemplare gesehen.

Die Stücke von Sibuyan sind mehr rotgelb, alle anderen lehmgelb, sonstige Abweichungen waren nicht festzustellen.

Leptotrichalus acidus sp. nov. Tafel 1, Fig. 7 und 8; Tafel 2, Fig. 8.

Mit *acerbus* sehr nahe verwandt und ohne Penisvergleich schwer zu trennen, Ausfärbung wie dort, der Prothorax meist in der hinteren Hälfte und in der Spitzenpartie gelblich, kann aber auch ganz gelb werden. Fühler viel gedrungener als bei jener Art, namentlich tritt das bei den mittleren Gliedern auffällig hervor. Prothorax mit etwas kräftigen, mittleren Querwülsten. Punktierung am Vorderrand kräftig, sonst fehlend. Alles übrige gleich *acerbus*. Im Gegensatz zu *acerbus* ist der Penis mit Ausnahme des Spitzenteiles stark pigmentiert; die Form ist eine total andere.

Länge, 7 bis 9 Millimeter; Breite (hum.), circa 2.

Philippinen: Mount Maquiling, Provinz Laguna, Luzon; Sibuyan; Mount Banahao, Luzon (*Baker*). Typen im Dresdener Museum. Zwölf Exemplare gesehen. Wesentliche Variationen waren nicht festzustellen.

Leptotrichalus acutus sp. nov. Tafel 1, Fig. 10; Tafel 2, Fig. 9.

Einfarbig grauschwarz, durch die am ganzen Körper vorhandene seidige, dichte Behaarung grauglänzend. Prothorax zuweilen an den hinteren Aussenecken etwas heller, braungelb.

Kopf und Fühler normal. Prothorax sehr schlank, in der Mitte, an der Einmündungsstelle der Querrunzeln meist winklig nach innen gebogen, Punktierung an den Rändern meist nur in einer Reihe, grob, tief. Rippenverlauf auf den Elytren normal, Gitterung gleich *accomodatus*. Beine und Abdomen normal. Penis mit grossem, stark verdicktem, hyalinen Präputium, der stielartige, hintere Teil dunkler pigmentiert.

Länge, 7 bis 9 Millimeter; Breite (hum.), circa 2.

Philippinen: Los Baños; Mount Maquiling, Provinz Laguna, Luzon; Mount Banahao, Luzon (*Baker*). Typen im Dresdener Museum, Cotypen in meinem Besitz. Ein Männchen, 3 Weibchen gesehen.

Auf den Elytren können die Rippen stark erhöht sein. Der Penisvergleich hat aber ergeben dass es sich nur um *acutus* und nicht um eine eigene Art handelt.

Leptotrichalus cyaniventris (Kirsch). Tafel 2, Fig. 10.

Metriorrhynchus cyaniventris KIRSCH, Mitt. Zool. Mus. Dresden 1 (1875) 35.

Malakka (Typus), Sumatra: Deli Sibolangit (*Jachan*), Boekit Gabah, ein Berg an der Südwestküste Sumatras oberhalb Benkoelen, Urwald, 2,000 bis 3,000 Fuss hoch (*Drescher*), Ostküste Brastagi, 1,300 Meter hoch (*Corporaal*); Deli, Ober-Langkat (*Reinsch*), Mentawei: Sipora, Sereinu (*Modigliani*); Java, W. Silabintanah (*G. E. Bryant*), G. Slamat, Vulkan an der Südküste Midden Java (*Drescher*); Südost Borneo, Nordost Borneo, Sandakan (*Baker*), West Sarawak, Mount Matang, Mount Merinjak, Quop (*Bryant*).

Nennenswerte Variationen konnte ich nicht nachweisen. Auf Borneo kommt eine Form vor, deren Rippen und Gitterung an der Basis hellbraun behaart ist und damit an einen Typus erinnert, der auch in anderen Gattungen vorkommt und in Borneo nicht selten ist. Durch Penisvergleich ist die Uebereinstimmung mit der typischen Form sichergestellt. Es finden sich auch Uebergänge.

Leptotrichalus acerbus sp. nov. Tafel 1, Fig. 9, 11, und 12.

Prothorax mehr oder weniger, immer aber noch gegen die Hinterecken, meist das Schildchen, zuweilen auch die Schenkel an der Basis gelbbraun, sonst pechschwarz. Kopf normal. Fühler sehr schlank, sonst normal. Prothorax am Uebergang vom Vorder- zum Seitenrand stumpf-eckig, Areole sehr schmal, mit kurzem, stumpfem Kiel mit dem Vorderrand verbunden, an den Rändern grob, zuweilen undeutlich punktiert, überall anliegend behaart. Erste Rippe der Elytren kurz, zweite bis hinter die Mitte reichend, Gitterung gleich *accomodatus*. Beine und Unterkörper normal. Penis schlank, hyalin, in Aufsicht von oben keulenförmig. Seitenansicht, Tafel 1, Fig. 12.

Länge, 7 bis 8.5 Millimeter; Breite (hum.), circa 2.

Philippinen: Imugan, Provinz Nueva Vizcaya, Luzon (*Baker*). Männchen, Type im Dresdener Museum, Weibchen in meinem Besitz.

Es lagen mir achtundzwanzig Stück vor, die alle, auch die aus Coll. Baker, von demselben Fundort stammten. Die Variation ist gering und hält sich in den in der Diagnose angegebenen Grenzen.

Leptotrichalus accuratus sp. nov. Tafel 2, Fig. 11.

Mit *acclinus* sehr nahe verwandt und nur durch die viel schlankeren Fühler unterschieden. Durch den in der Abbildung dargestellten Penis leicht und sicher zu trennen. Bei manchen Stücken sind Schildchen und Prothorax leicht gebräunt.

Länge, 6 bis 11 Millimeter; Breite (hum.) 2 bis 3.

Philippinen: Mount Banahao, Los Baños; Mount Maquiling, Provinz Laguna; Butuan, Mindanao; Sibuyan (*Baker*). Typen im Dresdener Museum.

Die Variation dieser Art ist sehr gross. Die einfarbigen Formen schwanken in der Farbe der Körperoberseite von orangerot bis lehmgelb. Die Elytren können die helle Farbe in grosser Ausdehnung verlieren und schwarz werden. So hatten alle Stücke, die ich von Sibuyan sah, schwarze Elytren, entweder ganz oder wenigstens teilweise. Ferner ist die Intensität der Rippenbildung sehr verschieden. Alle mir zur Verfügung stehenden Stücke sind auf den Penis untersucht, stets ist absolute Sicherheit der Art festgestellt.

Leptotrichalus accomodatus sp. nov. Tafel 1, Fig. 13; Tafel 2, Fig. 12.

Prothorax hell gelbbraun, basale Fühlerglieder, Trochanteren und Basis aller Schenkel bräunlich, Abdomen blaumetallisch, sonst rauchschwarz. Rüssel nur mässig verlängert, aber sehr bestimmt vorhanden. Prothorax an den tief eingesenkten Rändern grob, kräftig punktiert. Elytren mit sehr kurzer erste Rippe, zweite im vorderen Drittel verlaufend und dann nur noch unsicher zu erkennen, nur durch die doppelte Zahl der Gitterfiguren erkennbar, Gitterung zum Teil flach, ohne trennende Sekundärrippen, die Gitterfiguren ungleich, Behaarung schwach, nur im basalen Teil deutlicher.

Länge, 10 bis 12 Millimeter; Breite (hum.), 2.3 bis 2.8.

Süd-Celebes: Patunuang, Samanga, Bonthain (*Ribbe,* Berliner Museum) (*Fruhstorfer*). Typen im Dresdener Museum und in meinem Besitz.

Leptotrichalus completus sp. nov. Tafel 1, Fig. 14.

Unterseite des Körpers, Fühler und Kopf in wechselnder Tiefe braun bis schwarz, Prothorax, Schildchen, und die Elytren in der basalen Hälfte lehmgelb, Spitzenhälfte hell- bis dunkelbraun. Rüssel von mittlerer Länge, Mandibeln schmal. Fühler schlank, beim Weibchen sind die einzelnen Glieder etwas kürzer als beim Männchen. Prothorax gleich *acerbus.* Elytren wie der Prothorax speckig glänzend, die Primärrippen erhöht aber wenig scharf, Furchengitterung quadratisch, deutlich. Beine braun, Schenkel an der Basis heller, Vorderbeine ganz allgemein heller.

Länge, 10 Millimeter; Breite (hum.), circa 2.

Bali, Kintamani, und Moendaek (*Drescher*), 2 Männchen und Weibchen. Typen in der Sammlung Drescher und in meinem Besitz.

Es muss sich um eine sehr stark variierende Art handeln, die nach der Körperfarbe kaum bestimmbar ist. Die braune Farbe findet sich in allen Tiefen, auf den Elytren können die beiden Farbenkomplexe in einander übergehen.

Aehnlichkeit besteht nur mit *cicatricosus,* von der die Gestalt des Prothorax leicht trennt. Bei ersterer Art erweitert sich das Organ nach den Hinterecken stark, ist aber mehr von trapezoider Form, bei *completus* dagegen sind die Seiten fast gerade. Der Penis hat eine ganz eigentümliche Gestalt, findet sich aber bei *conciliatus,* der sonst ganz abweichend gebaut ist, wieder.

Leptotrichalus adolescens sp. nov. Tafel 1, Fig. 15; Tafel 2, Fig. 13.

Kopf, Rüssel, erstes bis drittes Fühlerglied, Prothorax, Elytren mit Ausnahme der Spitze, Beine und Sternum hell okergelb, Fühler vom vierten Gliede an braunschwarz, Oberkanten der Schenkel, Tarsen und die Deckenspitzen hellbraun, Abdomen blaumetallisch. Kopf und Fühler normal. Rippen auf den Elytren von normaler Länge, Primärrippen mässig, Sekundärrippen kräftig entwickelt, Gitterung sich deutlich von der Grundfläche abhebend, rechteckig bis quadratisch, Rippen und Gitterung sehr dicht behaart. Beine von normaler Gestalt, Schenkel wenig zusammengedrückt. Penis sehr zart, nur die Aussenhaut schwach hellgelb pigmentiert, sonst durchsichtig, Stiel schmal und lang, in Aufsicht an dem dolchartigen Präputium mit lyraartigen, durchsichtigen Anhängen, bei Seitenansicht erweitert sich das Präputium blasenartig nach unten.

Länge, 7.5 Millimeter; Breite (hum.), circa 2.

Philippinen: Mount Maquiling, Luzon. Alle gesehenen Stücke von diesem Fundort (*Baker*). Männchen, Typus im Dresdener Museum, Weibchen in meinem Besitz.

Gehört durch die Art der Rippenbildung zur *adjunctus*-Gruppe.

Leptotrichalus concinnus sp. nov.

Schwarz, nur der Prothorax und die Elytren in den basalen zwei Dritteln hell ziegelrot. Fühler wie bei *conciliatus*. Areole des Prothorax am Vorder- und Hinterrand geschlossen, Hinterecken nur wenig vorgezogen, dicht behaart. Die Primärrippen der Elytren stark convex, die Sekundärrippen nur schwach entwickelt, Gitterung meist quadratisch, Rippen und Gitterung sind mit ganz kurzer, dichter gekrümmter Behaarung besetzt.

Länge, 9 bis 10 Millimeter; Breite (hum.), 2 bis 2.5.

Java: G. Papandajan, Vulkan im Preanger, West Java (*Drescher*). Typen in dessen Besitz. Vier Weibchen gesehen.

Leider stand kein Männchen zur Verfügung um den Begattungsapparat zu prüfen. Es besteht aber vorläufig mit keiner anderen Art der Gattung Aehnlichkeit, die zu Verwechslung führen könnte. Die schwarzen Farbenpartieen heben sich von den roten scharf ab, namentlich das schwarze Schildchen. Die Variation scheint sich in erster Linie auf die Ausfärbung des Prothorax zu erstrecken, denn es kommen Stücke mit starker Neigung zur Schwarzfärbung vor.

Leptotrichalus effeminatus sp. nov. Tafel 1, Fig. 16; Tafel 2, Fig. 14.

Abdomen und Metasternum schwärzlich, mit schwachem Metallglanz, das letzte Abdominalsegment zuweilen schmutzig-gelb, Prosternum desgleichen, Beine mehr oder weniger braun in wechselnder Tiefe und Umfang, Kopf und Fühler dunkelbraun, Prothorax, Schildchen, und Elytren lehmgelb, letztere am Hinterrande zuweilen mit einem kleinen, schwärzlichen Wisch.

Länge, 6 bis 8 Millimeter; Breite (hum.), 2 bis 2.2.

Philippinen: Surigao, Mindanao; Kolambugan, Mindanao (*Baker*). Typen in meinem Besitz. Sieben Exemplare gesehen.

Ohne Penisautopsie von *admirabilis* und *celsus* nicht zu trennen. Die schwarzen Flecken auf den Elytren können recht tief in Farbe sein, bei reichem Material dürfte indessen hellbraune Farbe vorherrschen. Bei dunklen Stücken nimmt der Prothorax braune Farbe an; fehlen die Elytrenflecke, so sind auch die Beine hell.

Leptotrichalus circumscriptus sp. nov. Tafel 1, Fig. 17; Tafel 2, Fig. 15.

Mit *admirabilis* in einem Verwandtschaftskreis stehend und ausser dem ganz anders geformten Penis durch die Färbung der Elytren unterschieden. Die schwarze Farbe ist bei manchen Stücken an den Seitenrändern bis zum Humerus erweitert, ebenso ist die Sutura in mehr oder weniger grossem Umfang geschwärzt und im Spitzenteil laufen die beiden schwarzen Partieen zusammen. Die Verdunklung erstreckt sich bei dunklen Stücken auch auf das Schildchen, selbst der Prothorax ist etwas angedunkelt. Bei ganz tiefdunklen Tieren ist ferner der Kopf und die Körperunterseite schwarz. Die Ausfärbung ist also sehr variabel. Auf den Elytren ist die erste Rippe sehr kurz, die zweite endigt vor der Mitte, die dritte ist sehr stark erhöht, die vierte desgleichen, aber nur schwach ausgebildet.

Länge, 7.5 bis 8 Millimeter; Breite (hum.), circa 1.75.

Philippinen: Surigao, Mindanao; Butuan, Mindanao (*Baker*). Typen in meinem Besitz. Ein Männchen, 5 Weibchen gesehen.

Leptotrichalus cicatricosus sp. nov. Tafel 2, Fig. 16.

In die Verwandtschaft von *admirabilis* gehörig aber viel grösser, die Schwarzfärbung der Elytren ist ausgedehnter, tiefer schwarz und grenzt gegen die gelbe Farbenzone scharfrandig ab. Penis schlank, vorn mässig verdickt, keulig, sehr hellfarbig, fast hyalin, von *admirabilis* durch den Penis sicher und leicht zu unterscheiden.

Länge, 9 bis 10 Millimeter; Breite (hum.), circa 2.

Philippinen: Panay (Nordwest); Surigao, Mindanao; Butuan, Mindanao; Cuernos Gebirge, Negros (*Baker*). Typus in meiner Sammlung.

Ein Männchen, 3 Weibchen gesehen.

Leptotrichalus adjunctus sp. nov. Tafel 1, Fig. 18; Tafel 2, Fig. 17.

Prothorax und Elytren lehmgelb, letztere an der Spitze schwarz oder schwarzbraun; Kopf, Fühler, und Vorderbeine dunkler braun, Mittel- und Hinterbeine, Sternum, und Abdomen blaumetallisch, Unterseite des Körpers glänzend, sonst matt. Kopf und Fühler normal. Prothorax seitlich nur wenig und sanft nach innen geschwungen, Randpunktierung zart, undeutlich. Elytren mit sehr schwachen Primär- und kräftigen Sekundärrippen, Gitterung aus rechteckigen, gleichmässigen Figuren gebildet, ähnlich *acclinus,* überall einzeln, kurz behaart. Mittel- und Hinterschenkel seitlich stark zusammengedrückt. Penis keulig, Stiel tief braunschwarz pigmentiert, Präputium heller.

Länge, 10 bis 13 Millimeter; Breite (hum.), 2.5 bis 3.

Philippinen: Mount Banahao, Luzon; Baguio, Provinz Benguet; Sibuyan (*Baker*). Typen im Dresdener Museum. Zehn Exemplare gesehen.

Durch die schwache Ausbildung der Primärrippen und stärkeres Hervortreten der Sekundärrippen merkwürdig. Es hat dadurch den Anschein, als ob eine besondere Gattung, mit neun Rippen, vorliegt. In Wirklichkeit ist das aber nicht der Fall, und es kann keinem Zweifel unterliegen, dass *adjunctus* nur zu *Leptotrichalus* gehören kann. Alle anderen für die Gattung typischen Merkmale sind normal ausgeprägt.

Die Variation ist auch bei dieser Art sehr beträchtlich. Die schwarze Färbung der Elytren kann sich auf die äusserste Spitze beschränken und tiefschwarz oder nur mehr oder weniger grauschwarz sein, sie kann aber soweit an Ausdehnung gewinnen dass nur das basale Drittel übrig bleibt. Es lassen sich alle Uebergänge an Ausdehnung und Tiefe nachweisen. Beide Geschlechter sind der Variation gleich stark unterworfen.

Leptotrichalus admirabilis sp. nov. Tafel 1, Fig. 19, 20, und 21; Tafel 2, Fig. 18.

Prothorax lehmgelb, Elytren in der basalen Hälfte von gleicher Farbe; am Humerus seitlich beginnend wird die Spitzenhälfte von erdgrauer Farbe, Kopf schwärzlich, Rüssel mehr oder weniger braun, Schenkel an der Basis gelbbraun, im übrigen sind die Beine von braungrauer Farbe, Sternum braun in wechselnder Tiefe, Abdomen schwärzlich, metallisch. Kopf und Fühler normal, Prothorax sehr schlank, länger als an der Basis breit, der hinter der Mitte liegende Querwulst flach, Behaarung dicht. Elytren mit normal langen, deutlichen, kräftigen Primärrippen, Gitterung deutlich, scharfkantig, Figuren wie bei *accomodatus.* Schenkel flach zusammengedrückt. Abdomen normal.

Länge, 5 bis 10 Millimeter; Breite (hum.), 1.5 bis 2.

Philippinen: Mount Banahao, Luzon; Mount Maquiling, Provinz Laguna, Luzon (*Baker*). Typen in meinem Besitz. Sechsundzwanzig Männchen, 19 Weibchen gesehen.

Die dunkle Farbe auf den Elytren kann sehr wechseln, sowohl in Tiefe wie in Ausdehnung, selbst in der Grösse kommen erhebliche Differenzen vor. Die schwarze Partie der Elytren schneidet nach vorn niemals scharf ab, sondern verläuft allmählich. Auch auf der Körperunterseite wechseln die Farben zwischen schwarz und gelb.

Leptotrichalus femoralis [5] sp. nov. Tafel 1, Fig. 22, 23, und 24.

Habituell und in Ausfärbung ganz mit *cyaneiventris* und *dubitabilis* übereinstimmend, durch die Gestalt der Hinterbeine des Männchens und durch den Penis unterschieden.

Männchen.—Schenkel der Hinterbeine stark verdickt, aber wechselnd in Stärke, unterseits vor dem Knie immer mit gespaltenem Dorn, Schienen stark gebogen, gegenüber dem Schenkeldorn mit einer tiefen Einkerbung in welcher der Dorn hineinpasst.

Weibchen.—Schenkel normal, schlank, kein Schenkeldorn und keine Einkerbung an den Schienen, nur wellige Vertiefungen.

Länge, 12 bis 19 Millimeter; Breite (hum.), 3 bis 5.

Philippinen: Surigao, Mindanao; Kolambugan, Mindanao; Iligan, Mindanao; Butuan, Mindanao (*Baker*). Typen in meinem Besitz. Neunundzwanzig Männchen, 3 Weibchen.

Es kommen alle Farbenabstufungen vor, von hell lehmgelb bis rotorange. Die Stärke der Hinterschenkel geht mit der Körpergrösse korrelativ, doch bleibt auch bei kleinen Tieren der Schenkeldorn immer deutlich. Die genaue Festlegung der Weibchen ist nicht immer leicht, zuweilen fast unmöglich. Kleine Weibchen sind nicht sicher zu deuten.

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[5] This name is not included in the key for the reason that the description was forwarded by the author as an addendum to the MS. which had been previously submitted.—THE EDITORS.

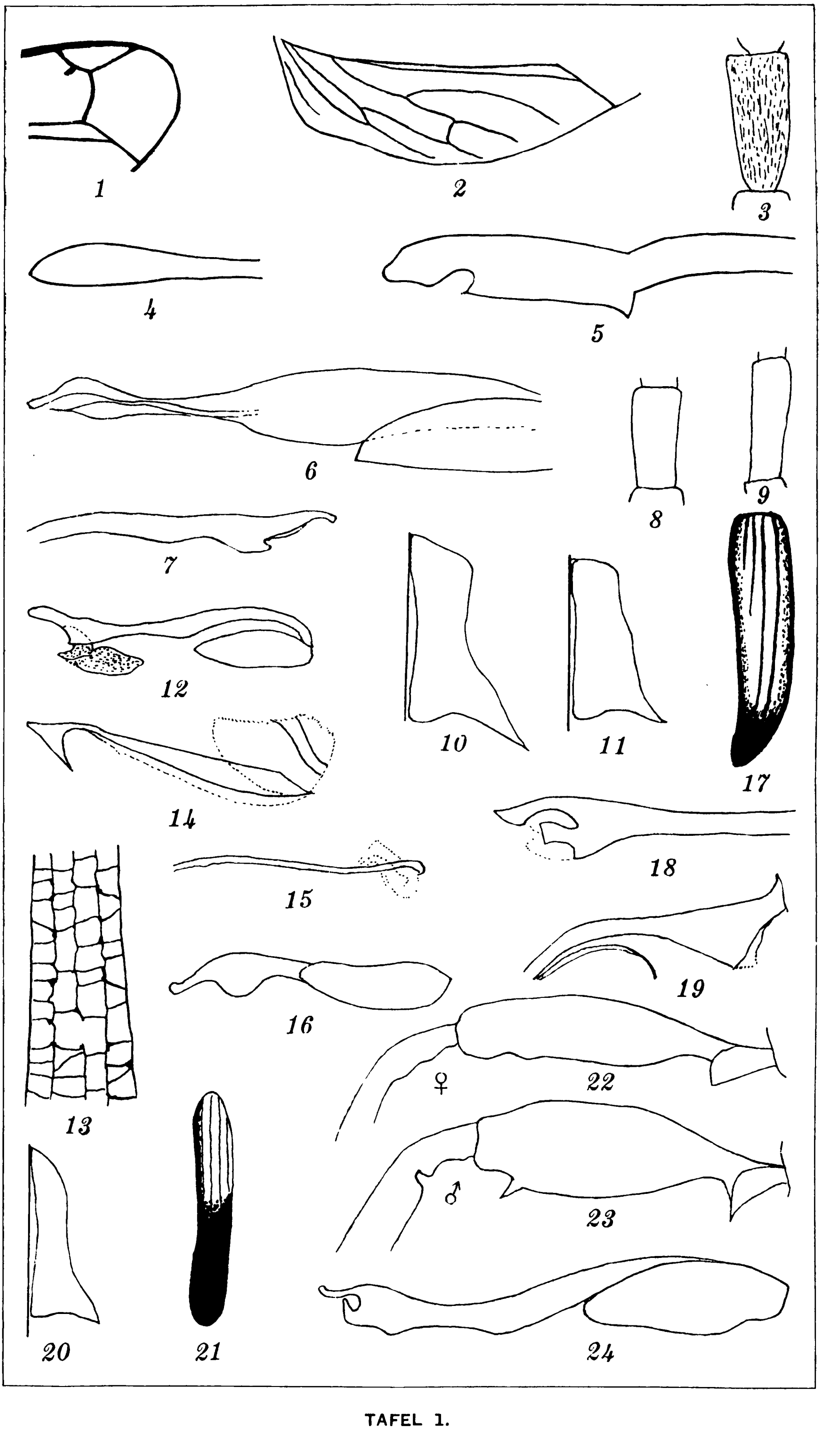
ILLUSTRATIONEN

TAFEL 1

FIG. 1. *Leptotrichalus* g. nov. Aderverlauf der Vorderflügel.
2. *Leptotrichalus* g. nov. Aderverlauf der Unterflügel.
3. *Leptotrichalus conciliatus* sp. nov. Männchen. Viertes Fühlerglied.
4. *Leptotrichalus acclinus* sp. nov. Penis in Seitenansicht.
5. *Leptotrichalus cyaneiventris* (Waterhouse). Penis in Seitenansicht.
6. *Leptotrichalus dubitabilis* sp. nov. Penis in Seitenansicht.
7. *Leptotrichalus acidus* sp. nov. Penis in Seitenansicht.
8. *Leptotrichalus acidus* sp. nov. Mittleres Fühlerglied.
9. *Leptotrichalus acerbus* sp. nov. Mittleres Fühlerglied.
10. *Leptotrichalus acutus* sp. nov. Prothorax.
11. *Leptotrichalus acerbus* sp. nov. Prothorax.
12. *Leptotrichalus acerbus* sp. nov. Penis in Seitenansicht.
13. *Leptotrichalus accomodatus* sp. nov. Elytrengitterung.
14. *Leptotrichalus completus* sp. nov. Penis in Seitenansicht.
15. *Leptotrichalus adolescens* sp. nov. Penis in Seitenansicht.
16. *Leptotrichalus effeminatus* sp. nov. Penis in Seitenansicht.
17. *Leptotrichalus circumscriptus* sp. nov. Elytren.
18. *Leptotrichalus adjunctus* sp. nov. Penis in Seitenansicht.
19. *Leptotrichalus admirabilis* sp. nov. Penis in Seitenansicht.
20. *Leptotrichalus admirabilis* sp. nov. Prothorax.
21. *Leptotrichalus admirabilis* sp. nov. Elytren.
22. *Leptotrichalus femoralis* sp. nov. Hinterschenkel und Schiene des Weibchens.
23. *Leptotrichalus femoralis* sp. nov. Hinterschenkel und Schiene des Männchens.
24. *Leptotrichalus femoralis* sp. nov. Penis.

TAFEL 2

FIG. 1. *Leptotrichalus acclinus* sp. nov. Penis, Unterseite.
2. *Leptotrichalus cyaneiventris* (Waterhouse). Penis, Unterseite.
3. *Leptotrichalus celsus* sp. nov. Penis, Unterseite.
4. *Leptotrichalus cereus* sp. nov. Penis, Unterseite.
5. *Leptotrichalus adversarius* sp. nov. Penis, Unterseite.
6. *Leptotrichalus adversarius* sp. nov. Penis, Seitenansicht.
7. *Leptotrichalus dubitabilis* sp. nov. Penis, Unterseite.
8. *Leptotrichalus acidus* sp. nov. Penis, Unterseite.
9. *Leptotrichalus acutus* sp. nov. Penis, Unterseite.
10. *Leptotrichalus cyaniventris* (Kirsch). Penis, Unterseite.
11. *Leptotrichalus accuratus* sp. nov. Penis, Unterseite.
12. *Leptotrichalus accomodatus* sp. nov. Penis, Oberseite.
13. *Leptotrichalus adolescens* sp. nov. Penis, Unterseite.
14. *Leptotrichalus effeminatus* sp. nov. Penis, Oberseite.
15. *Leptotrichalus circumscriptus* sp. nov. Penis, Seitenansicht.
16. *Leptotrichalus cicatricosus* sp. nov. Penis, Unterseite.
17. *Leptotrichalus adjunctus* sp. nov. Penis, Oberseite.
18. *Leptotrichalus admirabilis* sp. nov. Penis, Unterseite.



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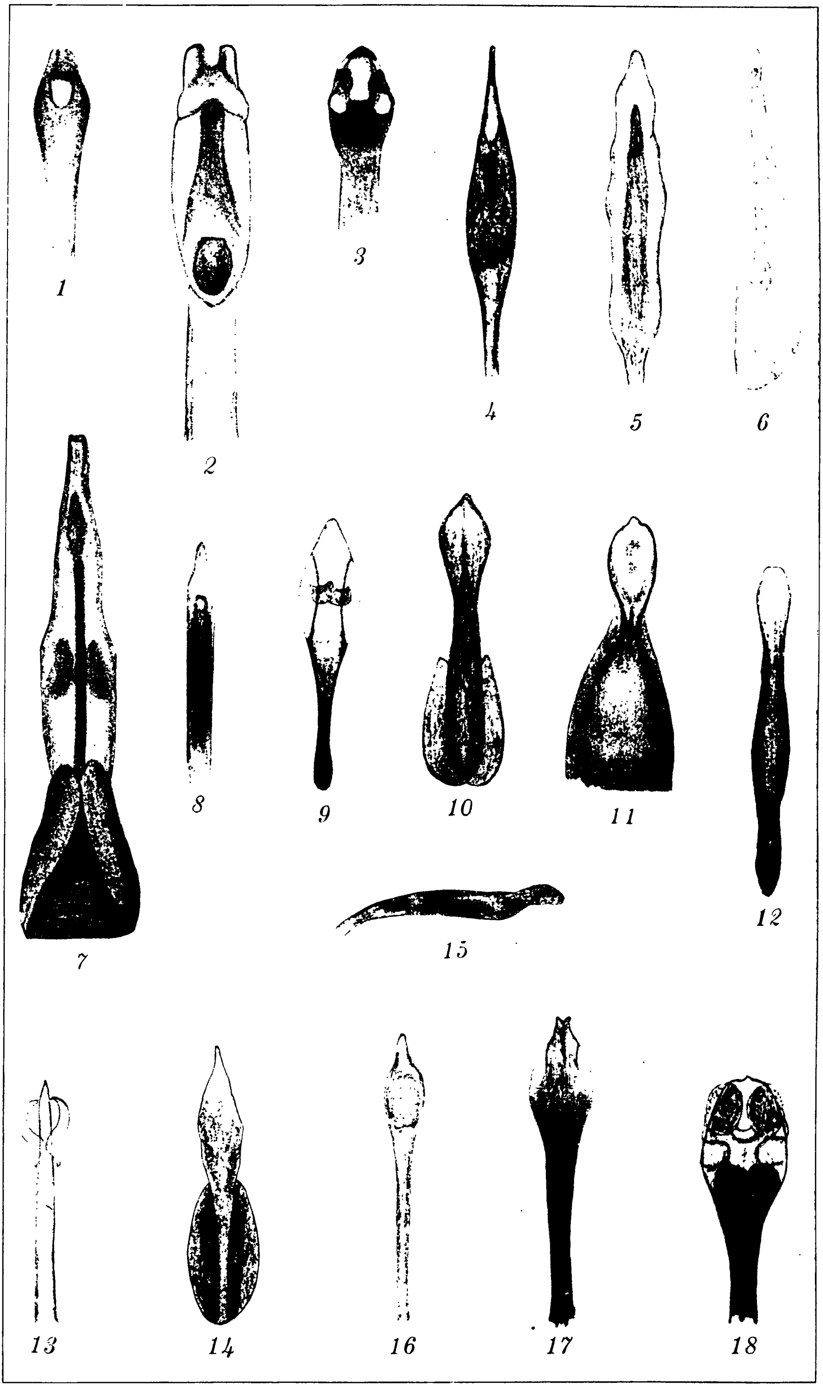

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THE PHILIPPINE JOURNAL OF SCIENCE

BUREAU OF SCIENCE
MANILA

MANILA
BUREAU OF PRINTING
1925

212261

THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science of the Government of the Philippine Islands

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THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 28 NOVEMBER, 1925 No. 3

A REPORT OF TYPICAL AND ATYPICAL BACILLUS DYSENTERIÆ SHIGA, WITH SPECIAL REFERENCE TO AGGLUTINATION REACTIONS

By G. R. LACY[1]

Of the Division of Biology and Serum Laboratory, Bureau of Science, Manila

During an epidemic of dysentery in 1898, Shiga(17) discovered a bacillus in the stool of dysentery patients which was specifically agglutinated by the sera of the patients from whom it had been isolated. The organism was proved to be the cause of the epidemic, in that it was isolated without difficulty from the stools of the dysentery patients and was not present in the stools either of normal persons or of patients suffering from other diseases. This work of Shiga's and the contemporary work of Kruse(9) stimulated investigations by other men in various parts of the world, and the next ten years saw the result of the work of Flexner,(5) Strong and Musgrave,(19) Vedder and Duval,(21) Park and Carey,(15) Martini and Lentz,(13) Hiss and Russell,(8) and others.

These authors brought out the fact that there seemed to be a multiplicity of organisms which were capable of producing bacillary dysentery. The organisms described by all of these authors except Kruse were fairly closely related to each other, but were distinctly different from Shiga's bacillus, whereas Kruse's organism was apparently identical with that of Shiga. In 1901 Kruse(10) described two classes of dysentery organisms, one that corresponded with his original organism and one that differed distinctly from it serologically. The first he designated as arising from true dysentery cases, and the second as arising from "pseudo-dysentery" cases. In 1902 Lentz(11) published the results of his investigations on the cultural reactions of various strains of dysentery and "pseudo-dysentery" bacilli, calling attention to the fact that the Shiga and Kruse organisms did not acidify mannit, whereas the "pseudo-dysentery" organisms did acidify it.

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[1] Special staff member of the International Health Board.

In 1904 all of the previously described dysentery organisms were reclassified by Hiss(7) into four distinct groups, according to the way they reacted in carbohydrate-containing media and according to their serological reactions. In carbohydrate-containing media it was found that, of the common carbohydrates used, glucose alone was attacked with acid formation by the Shiga and Kruse organisms, whereas both glucose and mannit were regularly attacked with acid formation by all of the other organisms. In addition to the main division made by the reactions on mannit, further subdivisions were made of the mannit-acidifying group by their respective reactions upon the other carbohydrate media.

The serological differentiation between the mannit-acidifying and mannit-nonacidifying groups was practically as distinct as was the carbohydrate reaction, the Shiga-Kruse group again forming one definite group, or type, whereas the mannit-acidifying group was divided into subgroups which corresponded fairly regularly with the carbohydrate reactions.

Subsequent to Hiss's work, Ohno(14) found fifteen groups represented in seventy-four cultures collected from numerous sources in the Orient. His grouping was made entirely upon carbohydrate reactions. He made agglutination tests also, but concluded that they were of little value in differentiation, due to the remarkably high group agglutination. His final conclusion was summed up in the following sentence: "We are compelled to consider the fifteen types of dysentery bacilli as constituting a single group." Since Ohno's work was published, it has been noted by others that the carbohydrate reactions of the mannit-acidifying group of *Bacillus dysenteriæ* are frequently unstable qualities. For example, a strain which at one time will show the reactions typical of Hiss group II may at other times show the typical reactions of group III or group IV.

The early reports concerning the Shiga-Kruse group have shown these bacilli to be more uniform than those of the mannit-acidifying group. In fact, it was not until the early part of the World War that instances of irregularities in this group were reported. During and since the war many observers have reported the finding of organisms which agree in most of their essential points with *Bacillus dysenteriæ* Shiga, but vary from it sufficiently to suggest that there may be more than one type of Shiga bacillus. The Schmitz bacillus, which was reported by Schmitz(16) as the cause of an epidemic of dysentery in one section of Germany during the war, is one of the best examples. Although it is claimed by some writers that the Schmitz organism is not one of true *Bacillus dysenteriæ,* it has been proved that it will produce lesions in the rabbit similar to those produced by true *Bacillus dysenteriæ* Shiga. In our experience with a strain supplied by the Hygienic Laboratory of the United States Public Health Service, the only difference we have been able to note in the lesions produced experimentally in the rabbit by the Schmitz organism and by typical *Bacillus dysenteriæ* Shiga was that the former did not produce as severe lesions in the intestines of fatal cases as did the latter. Other authors have reported variations in the agglutinability of different strains of *Bacillus dysenteriæ* Shiga. As mentioned above, Ohno(14) found that agglutination reactions with mannit-acidifying and mannit-nonacidifying groups were only confusing and were of no value in differentiation. Mackie(12) isolated several strains of bacilli which were culturally similar to *Bacillus dysenteriæ* Shiga but were not agglutinated by anti-Shiga serum. Hamburger(6) also reported the isolation of inagglutinable *Bacillus dysenteriæ* Shiga, but he stated that his strains were rendered agglutinable by heating for one hour at 100° C. Dumas(4) has reported fifty-seven strains of atypical *Bacillus dysenteriæ* Shiga. Zoller(22) has found Shiga cultures which were auto-agglutinable when grown either in broth or on agar slants. Benians(1) obtained an inagglutinable strain of *Bacillus dysenteriæ* Shiga from an agglutinable one by suspending the latter in mucilage of tragacanth, injecting it subcutaneously into a guinea pig; two months after the injection, the area was aspirated and the inagglutinable form isolated from the material thus obtained. Solimano(18) found that, in working with *Bacillus dysenteriæ* Shiga, he obtained certain forms which were inagglutinable with immune serum of typical Shiga; these were rendered agglutinable by rapid transplantation on special culture medium. His report is especially interesting from the standpoint of the agglutination reactions. His tables show that animals immunized against the typical agglutinable Shiga strains produced agglutinins for all other agglutinable strains, but not for the inagglutinable ones. On the other hand, three of the animals immunized against separate strains of the so-called inagglutinable Shiga cultures produced agglutinins common for those three strains, but did not produce agglutinins for the typical agglutinable strains. After one of these three cultures had become agglutinable by immune serum of typical Shiga through rapid transplantation, the author immunized another animal against it and found that this animal developed agglutinins for the three so-called inagglutinable strains, but none for the typical agglutinable ones. In other words, the agglutinogenic properties of the culture remained the same, even though its agglutinability had been altered.

For a more-extensive review of the general subject of bacillary dysentery, the reader is referred to an article written by Davison(3) in 1922.

In our experience during the past year in Manila we have found several organisms which were similar, culturally and morphologically, to *Bacillus dysenteriæ* Shiga, but were not agglutinated by the serum obtained from animals immunized against typical *Bacillus dysenteriæ* Shiga cultures. The serum used had an agglutinin titer of 1 : 1,600, and yet there was no agglutination of these atypical bacilli even in a dilution of 1 : 100. They were agglutinated only in low dilutions (1: 10) by an antidysenteric serum obtained from a horse which had been immunized against both typical Shiga and Flexner strains. These findings brought up the question with us whether there might be two or more serological groups of the organisms which have been classified as *Bacillus dysenteriæ* Shiga.

SOURCE

It was thought advisable, therefore, to collect as many strains of *Bacillus dysenteriæ* Shiga as was convenient and to test all of these culturally and against several immune sera to determine the point in question. Forty-five strains were collected, some from the United States,[2] some from Japan, and the rest from the Philippine Islands. The majority of the organisms originated from cases of bacillary dysentery, but a few were isolated from apparently healthy carriers. (See Table 1.) The cultures from the carriers have been reported by Vazquez-Colet.(20) It was not possible to determine the date of isolation in many of the cultures, though this is a point of little consequence, since a sufficient number of the older cultures and those isolated from carriers were tested in animals and found to be pathogenic and to give intestinal and nerve lesions typical of *Bacillus dysenteriæ* Shiga.

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[2] These cultures were obtained through the courtesy of Dr. G. W. McCoy, director, Hygienic Laboratory of the United States Public Health Service.

CULTURAL REACTIONS

The first step in the experiment was to see if there existed any cultural difference between the various strains. In order to feel reasonably certain that the strains with which we were working were pure cultures, all strains were plated out and subcultures obtained from single isolated colonies. These subcultures were then used for study culturally and serologically. All of the strains produced on agar moist, slightly opaque, discrete colonies, having no tendency to coalesce. Gelatine was not liquefied. Hydrogen sulphide test was negative with all strains. Russell double sugar tubes all showed acid butt and unchanged slant. Litmus milk was at first acid, but after five or six days it was changed to alkaline, so that at the end of two weeks all strains except one were strongly alkaline; one strain remained acid during a period of more than four weeks of observation. Glucose, levulose, and galactose broths were acidified by all strains within twenty-four hours. Maltose, lactose, saccharose, mannit, dulcit, adonit, sorbit, rhamnose, raffinose, xylose, salicin, inulin, dextrin, and amygdalin were not attacked by any of the strains. The production of indol was the only differential point obtained culturally. Indol was produced by all except two of the strains which had not been agglutinated by immune serum of typical Shiga, whereas negative tests for indol were obtained from all strains that had been agglutinated by the immune serum of typical Shiga. This finding is in accord with the cultural reactions of the Schmitz(16) organism and with the inagglutinable organisms reported by Solimano.(18)

IMMUNIZATION EXPERIMENTS

Selection of animals for production of immune sera.—Rabbits were selected as the animals to be used in the production of the immune sera, since they were easily obtainable and were known to respond rapidly to injections of *Bacillus dysenteriæ.* Full-grown healthy rabbits, weighing approximately 2 kilograms, were used in all cases where immune serum was desired.

TABLE 1.—*Showing source of the forty-five strains of Bacillus dysenteriæ.*

Strain No.	Year.	Source.	Country.	Original designation.
1	------	Patient with clinical dysentery.	Japan	Japan, S-1.
2	------	do	do	Japan, S-2.
3	------	do	do	Japan, S-3.
4	------	do	do	Japan, S-4.
5	------	do	Philippine Islands	Shiga-1.
6	------	do	do	Shiga-2.
7	------	do	do	Shiga-3.
8	------	do	do	Shiga-4.
9	------	do	do	Shiga-5
10	------	do	do	Shiga-6.
11	------	do	do	Shiga-7.
12	------	do	do	Shiga-8.
13	------	do	do	Shiga-9.
14	------	do	do	Shiga-10.
15	------	do	do	Shiga-11.
16	------	do	do	Shiga-12.
17	1923	do	do	Calhoun.
18	------	Unknown	United States	J-16-A.M.S.
19	------	do	do	73-H.L. of U.S. P.H.S.
20	------	do	do	R-I-100.
21	1924	Patient with clinical dysentery.	Philippine Islands	Ipor.
22	1924	do	do	G. Manansala.
23	1924	do	do	A. Romero.
24	------	do	do	Shiga-18.
25	1924	Autopsy, dysentery	do	A-10971.
26	1924	Patient with clinical dysentery.	do	Beltran.
27	1924	do	do	D. Flores.
28	1923	Autopsy, dysentery	do	A-10028.
29	------	Patient with clinical dysentery.	do	L.S. 56.
30	------	do	do	L.S. 59.
31	1923	do	do	Leyte S-1.
32	1923	Autopsy, dysentery	do	A-10168.
33	1923	Patient with clinical dysentery.	do	Bellones.
34	------	do	do	V.L.S.
35	1924	Carrier	do	Zusuki.
36	------	Patient with clinical dysentery.	do	L. L. S.
37	------	Unknown	United States	RI-114 F.H.L. of U.S. P.H.S.
38	------	do	do	Schmitz.
39	------	do	do	109-R. I.
40	1924	Carrier	Philippine Islands	Espiritu.
41	1924	do	do	Pili.
42	1924	do	do	M. Reyes.
43	1924	do	do	Salvatierra.
44	1924	do	do	J. Mendiola.
45	1924	do	do	J. Isla.

Selection of cultures for immunization of animals.—The cultures, as stated above, had been obtained from Japan, from the United States, and from widely separated areas in the Philippine Islands. In order to have an intelligent starting point, it was deemed advisable to prepare one immune serum for a Philippine strain which had been isolated at the Bureau of Science, another for a Japanese strain, a third for an American strain, and still another for one of the strains which we had found to be inagglutinable with our anti-Shiga serum. After the four animals had been immunized and all of the cultures tested against their sera for purposes of orientation, other cultures were selected and animals were immunized against these. The total number of strains collected was forty-five, and twelve strains were selected from these for the production of immune sera.

METHOD OF IMMUNIZATION

The strains selected for immunization purposes were plated on plain agar and Teague methylene blue-eosin medium. Single colonies were picked from the plates and tested for the typical reactions on carbohydrates, as stated above.

The cultures for injection were grown for twenty-four hours on agar slants having a reaction of approximately Ph. 6.0. The growth was then suspended in physiological saline solution and heated in a water bath at 56° C. for one hour. Four intravenous injections were then given at seven-day intervals; the first injection was 1 cubic centimeter of a very light suspension, and each subsequent injection was twice the amount of the preceding one.

Some of the cultures grown on agar, and then killed by heating at 56° C. for one hour, were kept in sterile condition at 6° to 10° C. and used for all four injections, no preservative having been added. Other cultures were used fresh for each inoculation; that is, the culture was grown for twenty-four hours and killed by heating at 56° C. for one hour each time just before it was to be used. It was found that for the production of agglutinins one method could be used with as good result as could the other. The former method was less troublesome and the amount used could be more uniformly graduated. Each animal was bled seven days after receiving the last injection of vaccine. The sera were tested against all of the forty-five cultures, the reactions of which are shown in Table 2, which is a composite table of all the tests.

TABLE 2.—*Showing results of agglutination tests of twelve immune sera, each tested against the forty-five strains.*

Strain No.	Immune serum No.											
	1	6	9	12	17	18	33	28	36	39	37	38
1	+	+	+	+	+	+	—	—	—	—	—	—
2	+	+	+	+	+	+	—	—	—	—	—	—
3	+	+	+	+	+	+	—	—	—	—	—	—
4	+	+	+	+	+	+	—	—	—	—	—	—
5	+	+	+	+	+	+	—	—	—	—	—	—
6	+	+	+	+	+	+	—	—	—	—	—	—
7	+	+	+	+	+	+	—	—	—	—	—	—
8	+	+	+	+	+	+	—	—	—	—	—	—
9	+	+	+	+	+	+	—	—	—	—	—	—
10	+	+	+	+	+	+	—	—	—	—	—	—
11	+	+	+	+	+	+	—	—	—	—	—	—
12	+	+	+	+	+	+	—	—	—	—	—	—
13	+	+	+	+	+	+	—	—	—	—	—	—
14	+	+	+	+	+	+	—	—	—	—	—	—
15	+	+	+	+	+	+	—	—	—	—	—	—
16	+	+	+	+	+	+	—	—	—	—	—	—
17	+	+	+	+	+	+	—	—	—	—	—	—
18	+	+	+	+	+	+	—	—	—	—	—	—
19	+	+	+	+	+	+	—	—	—	—	—	—
20	+	+	+	+	+	+	—	—	—	—	—	—
21	+	+	+	+	+	+	—	—	—	—	—	—
22	+	+	+	+	+	+	—	—	—	—	—	—
23	+	+	+	+	+	+	—	—	—	—	—	—
24	+	+	+	+	+	+	—	—	—	—	—	—
25	+	+	+	+	+	+	—	—	—	—	—	—
26	+	+	+	+	+	+	—	—	—	—	—	—
27	+	+	+	+	+	+	—	—	—	—	—	—
28	—	—	—	—	—	—	+	+	+	—	—	—
29	—	—	—	—	—	—	+	+	+	—	—	—
30	—	—	—	—	—	—	+	+	+	—	—	—
31	—	—	—	—	—	—	+	+	+	—	—	—
32	—	—	—	—	—	—	+	+	+	—	—	—
33	—	—	—	—	—	—	+	+	+	—	—	—
34	—	—	—	—	—	—	+	+	+	—	—	—
35	—	—	—	—	—	—	+	+	+	—	—	—
36	—	—	—	—	—	—	+	+	+	—	—	—
37	—	—	—	—	—	—	—	—	—	—	+	—
38	—	—	—	—	—	—	—	—	—	—	—	+
39	—	—	—	—	—	—	—	—	—	+	—	—
40	—	—	—	—	—	—	—	—	—	—	—	—
41	—	—	—	—	—	—	—	—	—	—	—	—
42	—	—	—	—	—	—	—	—	—	—	—	—
43	—	—	—	—	—	—	—	—	—	—	—	—
44	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—

Table 2 shows that, serologically, the forty-five strains examined were composed of two well-defined groups, and nine strains not in either group. Twenty-seven strains were agglutinated by one group of sera, nine by another, and the remaining nine were not agglutinated by either group of sera.

The macroscopic method of agglutination was used throughout. When the agglutination tests were made, each serum was tested against the cultures in dilutions varying from 1 : 100 to 1 : 12,800. The mixtures of diluted sera and cultures were incubated at 37° C. for eighteen hours, after which the readings were made and recorded. All readings were made without the aid of a magnifying lens. The dilutions from 1 : 100 to 1 : 400 recorded as positive showed complete agglutination and sedimentation, as indicated in Table 2, whereas there was no agglutination in those recorded as negative. A few of these sera had a titer as high as 1 : 6,400. There were less group agglutinins existing between the two groups shown here than between either of these groups and *Bacillus dysenteriæ* Flexner. It will be noted that sera were prepared from three of the strains (37, 38, and 39) which were not agglutinated by any serum, and that these three immune sera contained agglutinins for their homologous cultures only.

Number 39 was the Schmitz strain, received from the Hygienic Laboratory of the United States Public Health Service. By referring again to Table 2, it will be seen that there was no serological relationship between strain 39 and any of the other strains shown here. It might be stated further that all of the nine cultures comprising the small agglutinable group were isolated in the Philippines—seven in Luzon and two in Leyte. The large agglutinable group was composed of strains obtained from the Philippines, Japan, and America. Five of the inagglutinable strains were isolated in the Philippines, and the other three were sent to us from the United States.

Having nine cultures that were inagglutinable with the immune sera of either the small or the large group, it occurred to us that these might be rendered agglutinable either by the rapid transplantation method of Solimano(18) or by the heating method of Hamburger.(6) Therefore, the strains were transferred daily for several days and again tested for agglutinability. The transplantation made no change whatever in their agglutinability, all the tests resulting as they did in the earlier examinations. Some of the cultures were more than one year old and had remained entirely unchanged.

The cultures were then examined according to the method of Hamburger. All of the inagglutinable strains and two strains of each of the agglutinable groups were grown for twenty-four hours on acid agar and suspended in physiological saline solution. These suspensions of the organisms were heated for one hour at 100° C. and then cooled to 40° C. before they were added to the sera. The tests were made in the same way as the other agglutination tests had been made. One serum representing the large group and one representing the small group were used. These sera were set up in dilutions varying from 1 : 100 to 1 : 12,800, and the heated suspensions were then added. The mixtures were incubated for twenty-four hours at 37° C. and the results recorded. It was found that the heating had not changed the result of the reaction of either the agglutinable or the inagglutinable strains; the former were agglutinated only by their homologous sera, and the latter remained unagglutinated. We were unable, therefore, to change the agglutinability of our strains either by rapid transplantation or by heating.

ADSORPTION TEST

Table 3 shows the results of the adsorption test with serum 17, and Table 4 shows the results of the same test on serum 36.

TABLE 3.—*Showing the results of adsorption test with serum 17.*

Adsorbed with strain.	Strain added after twenty-four hours adsorption.	Results of agglutination in dilution of—				
		1:200	1:400	1:800	1:1,600	Control.
Homologous control test before adsorption.	----------	++++	++++	++++	++	—
Strain 17	17	—	—	—	—	—
Strain 36	17	++++	++++	++++	++	—
Strain 38	17	++++	++++	++++	++	—
Strain 43	17	++++	++++	++++	++	—

TABLE 4.—*Showing the results of adsorption test with serum 36.*

Adsorbed with strain.	Strain added after twenty-four hours adsorption.	Results of agglutination in dilution of—				
		1:200	1:400	1:800	1:1,600	Control.
Homologous control test before adsorption.	----------	++++	++++	++++	+++	—
Strain 36	36	—	—	—	—	—
Strain 17	36	++++	++++	++++	+++	—
Strain 38	36	++++	++++	++++	+++	—
Strain 43	36	++++	++++	++++	+++	—

The technic used in the experiments recorded in Tables 3 and 4 was as follows: Heavy suspensions of twenty-four-hour agar cultures from strains 17, 36, 38, and 43 were added separately to a 1 : 100 dilution of the serum to be tested. The suspensions were then incubated for twenty-four hours at 37° C., after which they were centrifuged at high speed for a sufficient length of time to obtain clear supernatant fluids. These supernatant fluids were then removed and dilutions of them were arranged in the same manner as for the agglutination tests mentioned above. The homologous strain was then added to the various dilutions of serum and the mixture incubated again for twenty-four hours, after which the readings shown in Tables 3 and 4 were taken. The other sera reacted similarly in this respect to these two and are therefore not recorded here.

PATHOGENICITY

Most of the strains with which we were working had been isolated from clinical cases of bacillary dysentery; a few had been isolated from carriers who showed no symptoms at the time the cultures were obtained (see Table 1). Since some of our strains had been kept on culture media for many months, it was important to know whether there was a difference in pathogenicity of the strains. Selections were made from among the two agglutinable groups and also from among the inagglutinable strains, and twenty-four-hour living cultures were injected intravenously into rabbits. The results of these injections are shown in the following protocols.

Rabbit 1, September 30, 1924.—A rabbit weighing approximately 1,000 grams was injected intravenously with one-fifth of a twenty-four-hour agar slant of culture 24. At the end of twenty hours the animal had a severe diarrhœa, was in a state of collapse, and paralysis of all four extremities was practically complete. The animal was sacrificed at this time, and autopsy showed that the lower part of the ileum and the whole of the cæcum were thickened, œdematous, and congested. The intestinal contents were examined microscopically and showed red blood corpuscles, pus cells, large swollen epithelial cells, and numerous bacteria. Cultures from the intestinal contents were negative for *Bacillus dysenteriæ* Shiga. A sample of bile from the gall bladder showed pure culture of the organism that had been injected.

Rabbit 2, September 30, 1924.—Culture 36 was grown on an agar slant for twenty-four hours, the entire growth was removed and suspended in sterile physiological saline solution, and one-fifth of it was injected intravenously into a rabbit weighing approximately 1,000 grams. On the following day the animal had a diarrhœa and was distinctly sluggish in its activities. At the end of forty-eight hours there was definite improvement in the animal's condition, and it was then injected with the remainder of the saline suspension of the organisms with which it had been injected previously. The second injection was made at 3.00 p. m. and the animal died during the following night. Autopsy showed a congested œdematous cæcum, less marked than that of the former animal. The organism was isolated in pure culture from the gall bladder, but was not found in the intestinal contents.

Rabbit 3, September 30, 1924.—Culture 38 was grown on an agar slant for twenty-four hours, the entire amount was removed and suspended in sterile physiological saline solution, and one-fifth of it was injected intravenously into a rabbit weighing approximately 1,000 grams. At the end of twenty-four hours the animal had a diarrhœa, was sluggish in its activities, and when placed on its side made no effort to regain an upright position. At the end of forty-eight hours the symptoms had almost entirely subsided, and the remaining four-fifths of the saline suspension of bacteria were injected intravenously. This was done at 3.15 p. m., and the animal died during the night. Autopsy showed a distinctly congested and œdematous cæcum of about the same degree as in rabbit 2. The organism was isolated in pure culture from the gall bladder, but was not found in the intestinal contents.

Rabbit 4, September 30, 1924.—Culture 43 was grown for twenty-four hours on an agar slant, the whole amount of growth then suspended in sterile physiological saline solution, and one-fifth of it was injected intravenously into a rabbit weighing approximately 1,000 grams. At the end of the first twenty-four hours the animal had a diarrhœa, was distinctly sluggish in its activities, and when placed on its side made practically no effort to regain an upright position. There was definite improvement at the end of forty-eight hours, and the animal was then injected intravenously with the remaining four-fifths of the culture. This was done at 3.30 p. m., and the animal died some time during the following night. Autopsy showed a congested, œdematous cæcum, similar in appearance to that of the last two.

The organism was isolated in pure culture from the gall bladder, but was not found in the fæcal cultures.

In these four instances the organisms recovered from the gall bladders of the rabbits corresponded in every way to the organisms that had been injected into the animals.

PROTECTION EXPERIMENTS

It was of importance, from the therapeutic standpoint, to know if the course of the infection with these different strains could be influenced by the use of the polyvalent antidysenteric horse serum, prepared by the Bureau of Science and in use in the Philippine Islands for the treatment of bacillary dysentery. All of the typical Shiga organisms included in the collection used for the preparation of this therapeutic serum were shown, by serological analysis, to belong to the large group recorded in Table 2.

For the protection experiments four healthy rabbits (5, 6, 7, and 8), weighing approximately 1,000 grams each, were selected and given 5 cubic centimeters of the polyvalent antidysenteric serum intraperitoneally. Twenty-four hours after injection of the serum, rabbit 5 was injected intravenously with the entire growth from a twenty-four-hour agar slant of strain 24, rabbit 6 was injected intravenously with a similar amount of strain 38, and rabbit 7 was injected with an equal amount of strain 43. These three animals remained entirely healthy during a period of two weeks' observation, no ill effects resulting from the injections. Rabbit 8 was injected intravenously, at the same time as the three other rabbits, with the entire growth from a twenty-four-hour agar slant of strain 36. The animal died four hours after the injection of the culture. At autopsy no gross lesions were observed in the intestines.

Two other rabbits, weighing approximately 1,000 grams each, were then selected; one was injected intraperitoneally with 5 cubic centimeters of the polyvalent antidysenteric serum and the other was injected with 10 cubic centimeters. At the end of another twenty hours these rabbits were each injected intravenously with the entire growth from a twenty-four-hour slant of strain 36. The animal that had been given 5 cubic centimeters of serum remained unaffected, while the one that had been given 10 cubic centimeters of serum was found dead in its cage on the following morning. This is an occurrence not uncommonly met with in serum protection experiments with

Bacillus dysenteriæ or its toxins, and is possibly dependent upon the difference in the individual susceptibility of the animals. Cultures from the gall bladder and intestinal contents of the animal that died were negative.

These experiments indicate that the polyvalent antidysenteric serum did afford protection against experimental infections in rabbits with these four strains of organisms, even though only one of them, No. 24, was included in the collection used for the preparation of the therapeutic serum.

DISCUSSION

Forty-five strains of organisms from stools of bacillary dysentery patients and carriers, and from autopsies, were studied in this series.

Culturally, all of these strains were identical with *Bacillus dysenteriæ* Shiga. Biochemically, they can be classed in two groups: one large group which is identical with *Bacillus dysenteriæ* Shiga in every respect, and a smaller group different from this type only in that the strains produced indol.

Serologically, the forty-five strains were divided sharply into two agglutinable groups of nine and twenty-seven, and a third inagglutinable group of nine. The agglutination and adsorption experiments were definite and clear-cut for the two fixed groups, there being no cross agglutination or adsorption between the two. The large agglutinable groups, composed of the twenty-seven strains, included all strains except two that were indol negative. The members of the small agglutinable group, composed of nine strains, were all indol positive. Those of the inagglutinable group were indol positive with two exceptions. Practically all of the large group had been obtained from acute bacillary dysentery patients.

The small agglutinable group had been obtained from acute bacillary dysentery patients, from autopsies, and from one carrier.

Six of the inagglutinable strains had been isolated from healthy carriers, but the history of the other three was unknown to us, the cultures having been obtained from the United States.

The different strains were pathogenic for rabbits when injected intravenously. The lesions produced were similar in all cases, except that the strains typical of *Bacillus dysenteriæ* Shiga produced lesions more severe than did any of the atypical strains.

In seeking a definite classification of the organisms described above we find, if we follow Bergey's (2) Manual of Determinative Bacteriology, arranged by a committee of the Society of American Bacteriologists, that the large agglutinable group corresponds in most respects to "Eberthella dysenteriae Castellani and Chalmers" (or *Bacillus dysenteriæ* Shiga), while the small agglutinable group and the inagglutinable group correspond more closely to "Eberthella ambigua" (Andrews) (or *Bacillus ambiguus* Andrews). The latter does not correspond entirely to the organisms reported above, in that our organisms were definitely pathogenic, while "Eberthella ambigua" is said to be not pathogenic. The organisms belonging to our small agglutinable group and to the inagglutinable group correspond culturally to the Schmitz bacillus and to the inagglutinable bacilli reported by Solimano. We are unable to make any statement as to their serological relationship, since we were not in possession of cultures from either of these authors.

Regardless of the definite species, the organisms described belong to the genus *Eberthella.* The practical point which we would mention in connection with this report is that, had we depended upon the immune serum of typical Shiga alone for diagnosis of these organisms, we should have missed eighteen out of the forty-five and, even with the sera of the two fixed groups, we should still have missed nine of the forty-five, or practically 20 per cent. We feel, therefore, that the use of cultural, biological, and serological methods should always be employed in studying this group of organisms.

The passive immunization of rabbits with the polyvalent antidysenteric serum prepared by the Bureau of Science protected the animals against large amounts of the living cultures of the strains of different groups given intravenously.

SUMMARY

1. Forty-five strains of bacilli similar to and identical with *Bacillus dysenteriæ* Shiga have been studied in this series.

2. Serologically, twenty-seven strains formed one group which corresponded to typical *Bacillus dysenteriæ* Shiga, nine formed a second group different from the first, and nine others formed a heterologous group agglutinated only by their homologous immune sera.

3. The members of the large agglutinable group were indol negative, while the members of the small agglutinable group

and the inagglutinable group were indol positive with two exceptions.

4. The two smaller groups corresponded culturally to the Schmitz bacillus, while the larger group corresponded to the Shiga-Kruse group of true *Bacillus dysenteriæ*.

5. The members of the three different groups were pathogenic for rabbits.

6. Polyvalent antidysenteric serum afforded protection against experimental inoculation with cultures of all three groups.

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FOURTH REPORT UPON DIPTERA PUPIPARA FROM THE PHILIPPINE ISLANDS

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FIVE TEXT FIGURES

For the material upon which this paper is based (the fourth in a series dealing with the Diptera Pupipara of the Philippine Islands) I am chiefly indebted to Mr. R. C. McGregor, from whom the specimens of the four species of Hippoboscidæ recorded were received. The record of the single species of the Streblidæ is due to the kindness of Mr. Edward H. Taylor.

STREBLIDÆ

Nycteribosca amboinensis (Rondani).

> *Nycteribosca amboinensis* (Rondani), FERRIS, Philip. Journ. Sci. 25 (1924) 395.

Present record.—From *Hipposideros diadema grisea,* Baguio, Luzon, August, 1923. Several specimens, collected by Edward H. Taylor. I have, in the reference cited above, recorded the species from the Philippine Islands and redescribed it.

HIPPOBOSCIDÆ

Genus **ORNITHOICA** Rondani

The distinctive characters of this genus are as follows: Hippoboscidæ with functional, noncaducous wings having several veins behind the costa including three "cross veins," an "anal cell" consequently present, the "third vein" (R_{4+5}) approximate to (generally said to be confluent with) the "second vein" (R_{2+3}) for about a third or half of its length and thus forming the most distinctive feature of the genus. Ocelli present. Claws two-toothed. Antennæ short and blunt. Abdomen without a median, striated, dorsal area.

Ten species have been referred to this genus, and almost all of them are so inadequately described that their status is dubious.

Austen and Aldrich have attempted to reduce several of them to synonymy with O. *confluenta* (Say), but as I have pointed out elsewhere their determinations are open to question. I have redescribed O. *beccariina* Rondani in a paper now in press,[1] and it is certainly distinct, at least from O. *promiscua* Ferris and

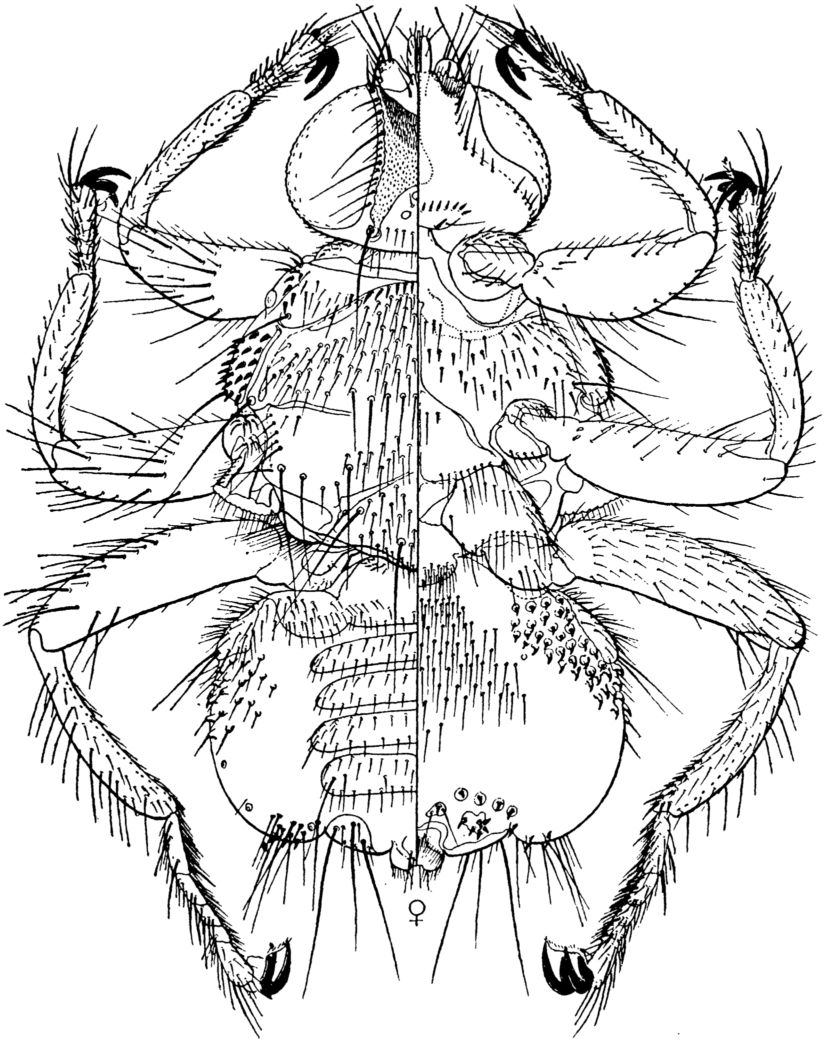

FIG. 1. *Ornithoica promiscua* Ferris and Cole; female, wings removed. From specimen from *Chrysocolaptes rufopunctatus* Hargitt.

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[1] Journ. Sarawak Mus.

Cole, the only other species of the genus the identity of which may be regarded as reasonably certain. There is the possibility that *O. promiscua* is actually identical with *O. confluenta* and, further, that *confluenta* is identical with the still older *O. turdi* (Latreille), but I do not believe that any of these points can be established from the existing literature.

Ornithoica promiscua Ferris and Cole. Figs. 1 and 2.

Ornithoica promiscua FERRIS and COLE, Parasitology 14 (1922) 203, figs. 19, 20.

Previous records.—From various passerines and from *Falco sparverius* in California, where it appears to be a very common species.

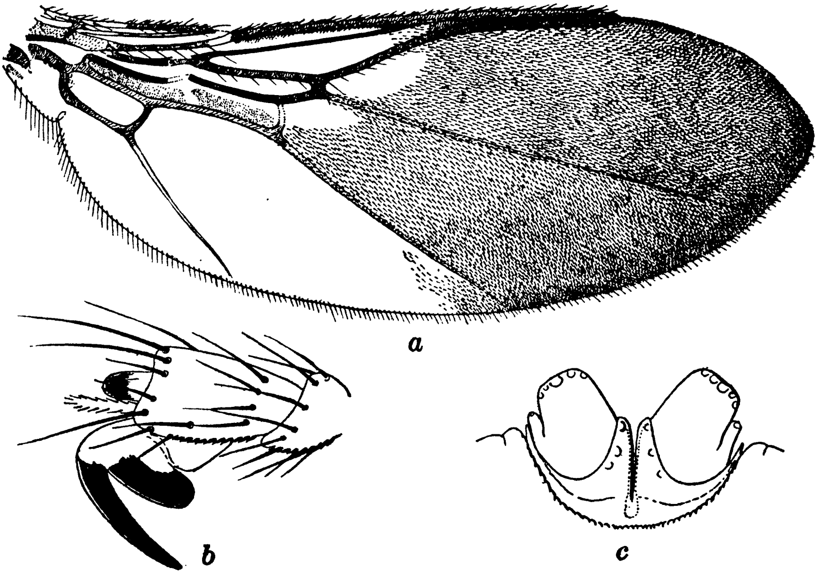

FIG. 2. *Ornithoica promiscua* Ferris and Cole; *a*, wing, to same scale as fig. 1; *b*, portion of posterior tarsus; *c*, clypeal region.

Present record.—Two females, one each from *Chrysocolaptes rufopunctatus* Hargitt and *Ceyx samarensis* Steere, collected at Loquilocon, Wright, Samar, Philippine Islands, June, 1924 (*R. C. McGregor*).

Notes.—I shall not here redescribe the species, but I am presenting new and, I think, somewhat better figures than those accompanying the original description. These should make it readily recognizable. It is a very small species, about 2.5 millimeters long without the wings. It is readily separable from *O. beccariina* Rondani, which should be present in the Philippine Islands, by the fact that the latter has but three transverse bars on the dorsum of the abdomen and also lacks the ventral tubercles on the abdomen.

Genus **ORNITHOPONUS** Aldrich

The following characterization is based upon *O. americanus* (Leach), the type of the genus: Hippoboscidæ with functional, noncaducous wings which have several veins behind the costa, these including but two "cross veins," the "anal cell" consequently lacking. Ocelli absent. Claws three-toothed. Clypeus very short, distinctly emarginate, with the lateral angles produced as more or less hornlike processes inclosing the very short and almost cylindrical antennæ. Lateral lobe of the metanotum without a nipplelike protuberance below the scutellum. Dorsum of the abdomen with a distinct median area of transverse striations.

This is the group that in recent years has generally been called *Olfersia,* but as Aldrich has shown this name applies to the group that has been called *Pseudolfersia.* Consequently, he has proposed the name *Ornithoponus* for the group, with *Feronia americana* Leach as the type.

This is a large genus, consisting chiefly of species that are practically unrecognizable from the descriptions, and it very likely includes a number of synonyms. One species, *O. nigrita* (Speiser), has been recorded by Bezzi from the Philippines, but if the determination is based only upon the original description of the species I am unable to see how the record can be anything more than a guess.

I may in this connection refer to the genus *Icosta.* This genus was established for a species, *Olfersia dioxyrrhina* Speiser, from New Guinea. It is supposed to be distinguishable from *Ornithoponus* by the fact that the clypeus is deeply emarginate (*ausgebuchtet*), the sides produced as horns about the base of the antennæ. As far as the description is concerned, I am unable to see anything of particular significance in this, for typical *Ornithoponus* has what is essentially the same structure, although perhaps not so strongly marked, and the character is very strongly developed in *Lynchia* and a species that I have described in an earlier one of these papers as an *Ornithophila.*

Unless there exists some other basis for the separation of *Icosta,* the genus is probably to be regarded as identical with *Ornithoponus,* and the latter would stand as a synonym. I refer to the matter here, as the following species might possibly be regarded as coming within the accepted definition of *Icosta,* particularly as it differs rather markedly from typical *Ornithoponus.*

Ornithoponus sartus sp. nov. Figs. 3 and 4.

Specimens examined.—The holotype, a female, and a paratype female from *Microhierax meridionalis* Grant, collected at Loquilocon, Wright, Samar, Philippine Islands, June 4, 1924; and the allotype from *Hydrocorax semigaleatus* Tweeddale, at the same place, May 21, 1924 (*McGregor*).

Female (fig. 3).—Length, on slide without wings, 5.5 millimeters. A dark brown species.

Head above almost destitute of setæ except for a series of small ones along the orbit, ventrally with a tuft of setæ below the antennæ and two diagonal rows of small setæ on each side. (Clypeus fig. 4, *c*) emarginate, the lateral angles produced into short, hornlike processes, which slightly surpass the antennæ. Eyes relatively small as compared with *O. americanus,* occupying scarcely more than half the length of the head.

Thorax almost bare, both dorsally and ventrally; with intermingled short and long setæ on the produced humeral angles and in front of the wing; scutellum margined with fine setæ. Mesothoracic spiracle strikingly large, the aperture protected by conspicuous fimbriated processes. The metathoracic spiracle is of the same nature but, as in all these forms, is concealed by the hind coxæ.

Wings (fig. 4, *a*) with the venation characteristic of the genus, the veins destitute of setæ except for the compound vein forming the costal border, which is beset to the apex with small setæ. The wing is entirely covered with minute setulæ, which are evenly distributed, except for the bare anal area. The shape of the wing is peculiar, owing to the slight but distinct emargination of the posterior border, as indicated in the figure.

The legs apparently present no specially distinctive characters. The nature of the claws is shown in fig. 4, *d.*

Abdomen with very striking characteristics. Dorsally there is a basal plate that shows a large, partially separated posterior lobe at the margin, the whole being continuous with a broad plate that occupies almost half of the ventral aspect of the abdomen. On the dorsal side, caudad of the lateral lobes of the basal plate, there is on each side a large plate, and caudad of this, near the apex of the body, a marginal plate which bears

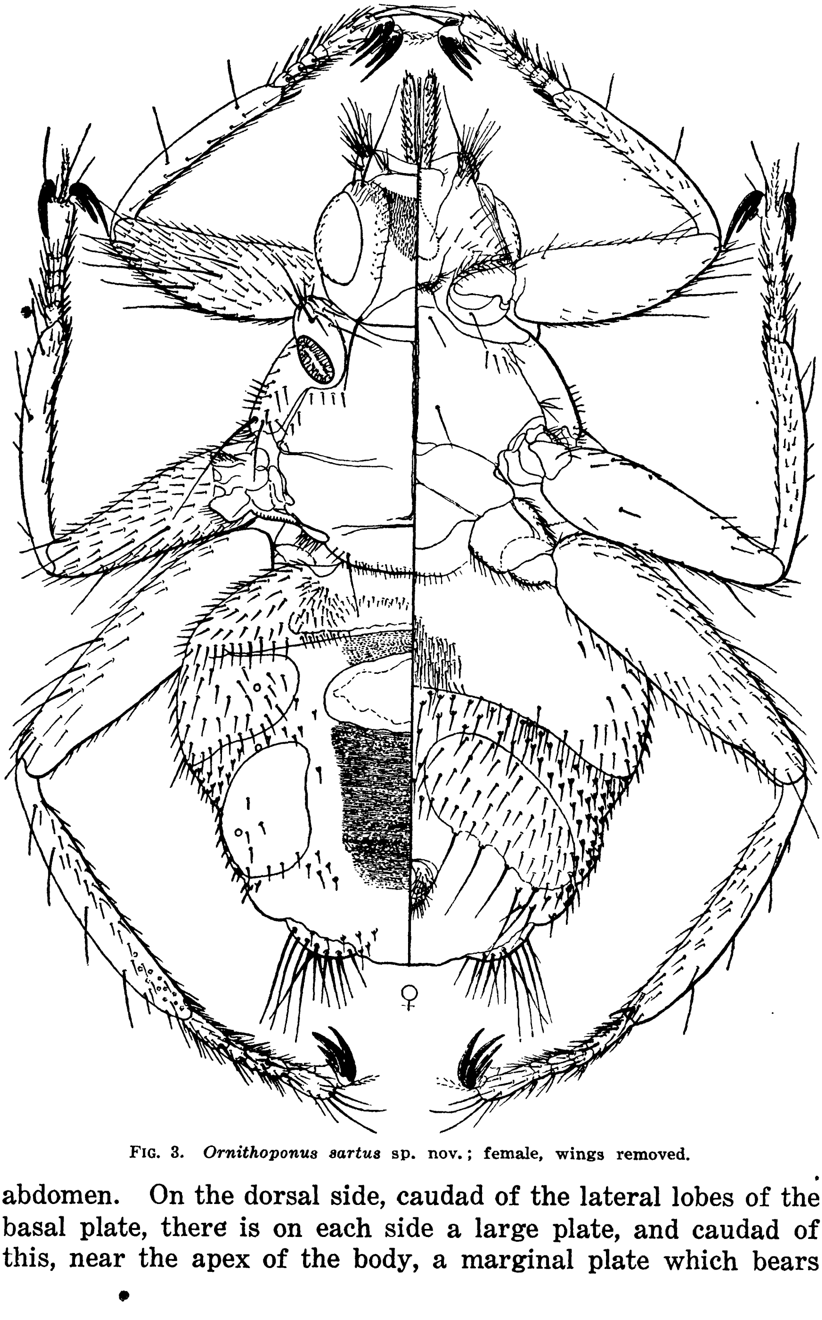

FIG. 3. *Ornithoponus sartus* sp. nov.; female, wings removed.

a number of long setæ. Also dorsally there is, immediately caudad of the basal plate, a distinct median plate and in addition to this plate the median portion is occupied by an area of fine transverse striations. Except for the basal plate the dorsum is almost destitute of setæ. On the ventral side caudad of the basal plate is a pair of large, oval plates, and between these and the apex is the genital opening, which is surrounded by small setiferous plates. The basal plate bears a median area of fine setæ, and between this plate and the others is an area of small, stout setæ borne on slight tubercles. The paired plates are beset with small setæ and bear larger setæ along their posterior border.

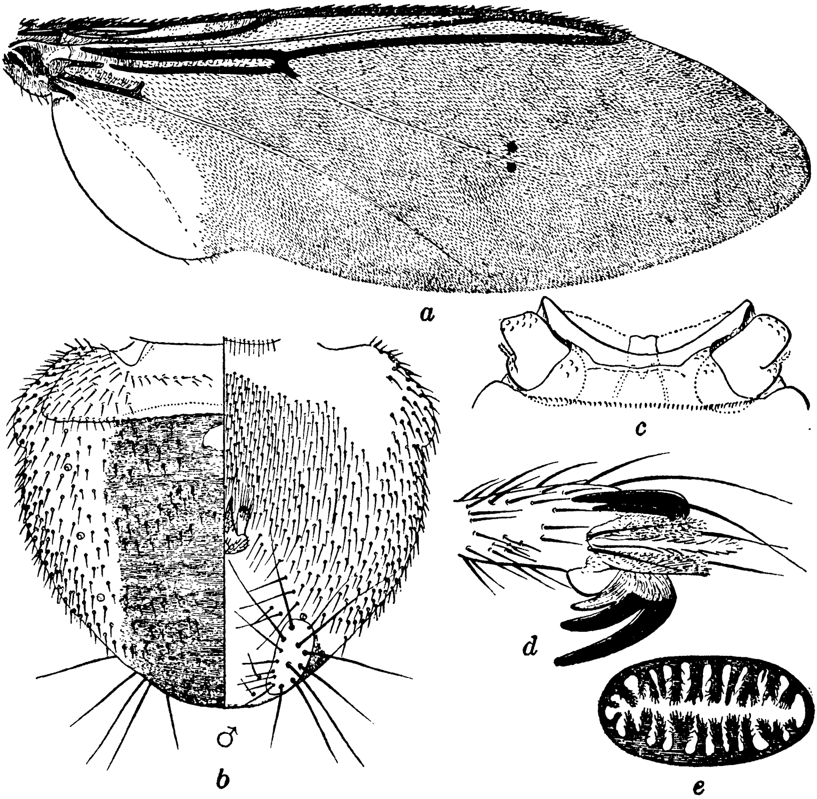

FIG. 4. *Ornithoponus sartus* sp. nov.; *a*, wing, to same scale as fig. 3; *b*, abdomen of male; *c*, clypeal region; *d*, claws; *e*, last segment of tarsus.

Male (*fig. 4, b*).—Length, 4.5 millimeters. In all respects identical with the female except for the abdomen. In this the basal plate is confined to the dorsum and is relatively small. Elsewhere the derm is membranous except for a very small, median dorsal plate immediately caudad of the basal plate, a pair of apical plates and a broad area of transverse striations which occupies the median third of the dorsum from the basal plate to the apex. The basal plate bears numerous small setæ, and the remainder of the derm is thickly beset with setæ, which are set on small tubercles. The apical plates bear several long setæ. The external genitalia consist of a small chitinized plate and a pair of small processes, the rudiments of the claspers, which appear on the ventral side at almost the center of the abdomen and bear numerous setæ. It is not possible, from the single available specimen, to work out the internal genitalia.

Notes.—This is a rather peculiar species, differing markedly from typical representatives of the genus. The very striking thoracic spiracles, the posterior emargination of the wing, and the character of the abdomen of the female are very distinctive. However, I am inclined to regard the species merely as an exceptionally well-marked but nevertheless definite member of *Ornithoponus.*

The male and the female differ so markedly as to suggest the possibility that they do not belong to the same species and, in addition, they are from different hosts. However, the correspondence is so close in all the details of structure, except those of the abdomen, that I regard them as belonging together. There are some other species in the family in which there is a very strongly marked sexual dimorphism.

Genus **MYIOPHTHIRIA** Rondani

Hippoboscidæ with vestigial wings, which attain scarcely half the length of the abdomen and which possess two longitudinal veins in addition to the costa; these close to the costal border, which bears numerous long setæ. Ocelli absent. Clypeus very long, occupying over half of the elongate head. Antennæ elongate, flattened. Eyes relatively very small. Tarsal claws three-toothed. Abdomen without a medium, transversely striated area on the dorsum.

This genus contains but two species, *M. reduvioides* Rondani, which is the type, and *M. lygaeoides* Rondani, both from the Oriental Region. The genus is very similar to *Crataerrhina,* differing from the latter in the short wings, *Crataerrhina* having the wings slender, pointed, and with several veins. That the two should actually be separated seems to me debatable.

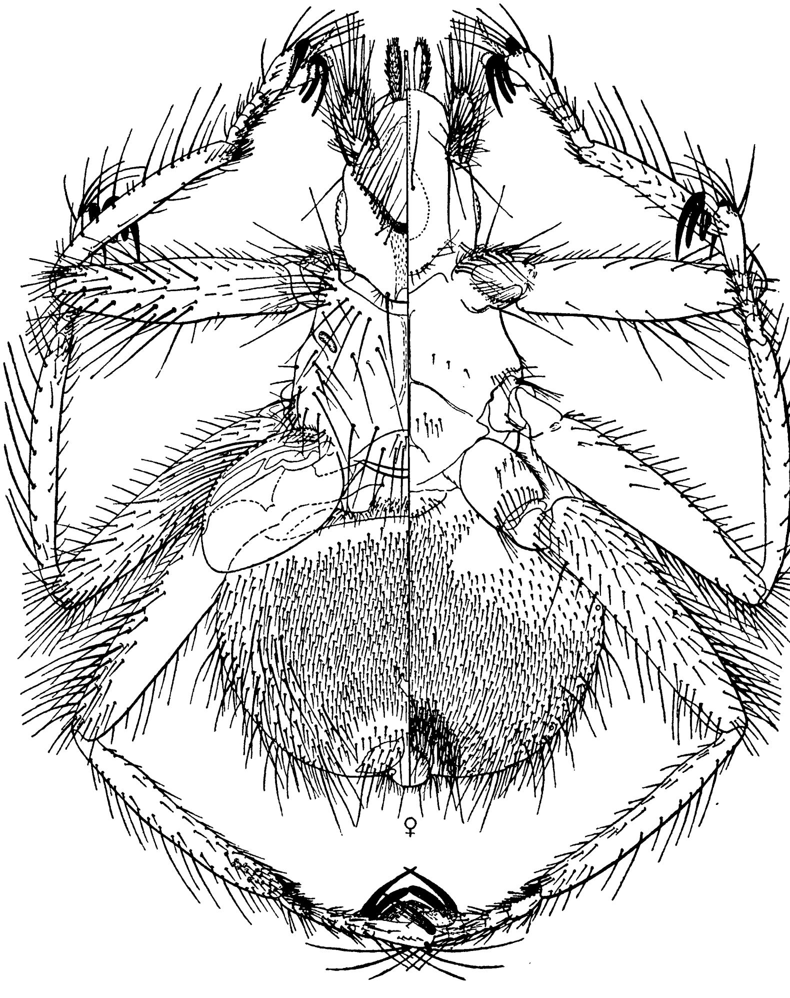

FIG. 5. *Myiophthiria reduvioides* Rondani; female.

Myiophthiria reduvioides Rondani. Fig. 5.

Myiophthiria reduvioides RONDANI, Ann. Mus. Civico Genova 12 (1878) 154.

Myiophthiria reduvioides Rondani, SPEISER, Ann. Mus. Civico Genova 41 (1904) 349.

Myiophthiria reduvioides Rondani, BEZZI, Philip. Journ. Sci. § D 8 (1913) 311.

Previous records.—Viti Island and the Philippine Islands.

Present record.—A single female from *Collocalia troglodytes* Gray, collected at Loquilocon, Wright, Samar, Philippine Islands, June 7, 1924 (*McGregor*).

Female.—Length, on the slide, 6 millimeters. A rather dark-colored species. Head greatly elongate and relatively very slender, equaling the thorax in length, the clypeal region occupying somewhat more than half the length; eyes very small; ocellar triangle very small; frontal vitta very narrow and inconspicuous; orbits very broad, margined mesially by numerous long setæ; antennæ long and slender, flattened, with numerous long setæ; head immediately ventrad of the antennæ with a process which bears numerous setæ.

Thorax relatively narrow, the lateral margins almost parallel; dorsally with a considerable number of long setæ, ventrally almost naked; humeral angles strongly produced, bearing numerous long setæ; spiracles rather inconspicuous.

Wings oval, very short, not reaching to the middle of the abdomen, the anterior margin formed by a stout vein, which bears numerous long setæ; behind this vein are two longitudinal veins connected by a cross vein, the homologies being indeterminate; wings without setulæ.

Legs with no specially distinctive features, but relatively very large.

Abdomen membranous throughout, except for a very small basal plate, both dorsally and ventrally, a very small median dorsal plate, and a pair of small apical dorsal plates; thickly beset with setæ which are mostly small and slender, but toward the lateral margins include many that are relatively long. Abdominal spiracles very small and inconspicuous.

Notes.—I have not been able to see the original description of either *M. reduvioides* or *M. lygaeoides,* and am basing this determination largely on the fact that Bezzi has recorded the former from the Philippine Islands, and upon fragmentary notes by Speiser.

Genus **ORNITHOCTONA** Speiser

Hippoboscidæ with functional, noncaducous wings which have seven longitudinal veins behind the costa and three cross veins, consequently with an anal cell. Ocelli present. Claws three-toothed; first segment of the posterior tarsi with a distinct, basal, transverse comb of stout setæ on the plantar surface. Antennæ very large and broad, flattened, nearly parallel, slightly exceeding the palpi in length.

This is a very large genus, containing about twenty names; most of the species are from the East Indian region. The descriptions are extremely poor, even in the case of the numerous forms that have been redescribed by Speiser, and practically none of them deals at all with the characters that it seems to me must be known if we are to have any reasonable basis for determinations.

One species, *O. nigricans* (Leach), has been recorded by Speiser from the Philippine Islands on the basis of a comparison with the types of the species. It is said by him to be a very widely distributed and common species in this area, but after a perusal of his notes I am still in the dark as to how it can be identified.

Ornithoctona magna Ferris.

Previous records.—From *Spilopelia tigrina,* Kalabit District, Borneo.

Present record.—A male from *Gallinago megala* Swinhoe, collected at Manila, Luzon, August 26, 1923; one female from *Tanygnathus luzonensis* (Linnæus), collected at Wright, Samar, July 10, 1924; and one from an owl, collected at Loquilocon, Wright, Samar, Philippine Islands, June 9, 1924 (*McGregor*).

Notes.—The description of this species is in press[2] at the time of this writing and will presumably appear before the present paper. It is accompanied by full figures, and as I assume that the journal in which it will appear is readily accessible to workers in the Orient, I am not here redescribing or refiguring it.

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[2] Journ. Sarawak Mus.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. *Ornithoica promiscua* Ferris and Cole; female, wings removed. From specimen from *Chrysocolaptes rufopunctatus* Hargitt.

2. *Ornithoica promiscua* Ferris and Cole; *a*, wing, to same scale as fig. 1; *b*, portion of posterior tarsus; *c*, clypeal region.

3. *Ornithoponus sartus* sp. nov.; female, wings removed.

4. *Ornithoponus sartus* sp. nov.; *a*, wing, to same scale as fig. 3; *b*, abdomen of male; *c*, clypeal region; *d*, claws; *e*, last segment of tarsus.

5. *Myiophthiria reduvioides* Rondani; female.

REMARKS ON CERTAIN INDO-MALAYAN FULGORA, WITH SPECIAL REFERENCE TO PHILIPPINE SPECIES

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TEN PLATES

Next to the Cicadidæ, the family Fulgoridæ (s. str.)[1] possesses some of the largest, most uniquely formed, and most splendidly colored of known Homoptera. It is divided into three subfamilies: Laternariinæ, Aphaeninæ, and Rhinorthinæ. The first of these is characterized by most remarkable prolongations of the head, and *Fulgora* is its largest and best-known genus. This genus is confined to the Oriental Tropics and attains its richest development in Indo-Malayan countries.

These insects have long borne the common name "lantern flies," based originally on the supposition that the apex of the cephalic processus, frequently reddish or ochraceous in striking contrast to the preceding color (as in *Fulgora clavata* or *F. pyrorhyncha*), was phosphorescent. This was an erroneous supposition, although the common name is still used. Kershaw, 1910,[2] found that the processus is occupied by a diverticulum of the alimentary canal.

Whereas most of the species are rarely represented in collections, and then in very few specimens, recent observations make it seem probable that many of the species are very abundant in their special habitat, which is the high upper reaches of virgin Malayan forests. Here their entire lives are spent, and to obtain their food they puncture the younger woody growth of forest trees and suck out the sap. They, together with a number of other important groups occupying the same habitat, probably have a great deal more to do with controlling the growth rate of the trees than is generally supposed.

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[1] Perhaps more properly called Laternariidæ.

[2] Zool. Jahrb. Syst. 29: 105–124, pl. 8, 9, 10 (*Pyrops*).

To the civilized people living in the countries where the insects of the genus *Fulgora* are actually abundant, they may remain entirely unknown, although they represent one of the most remarkable groups of living organisms peculiar to these countries. Moreover, explorers and entomologists, although in the country for the purpose of obtaining such things, may get few if any of them. Specimen cases filled with these startling creatures, of Philippine origin, shown to educated Filipinos and foreign residents, usually elicit the freely expressed doubt that they have been obtained in this country at all! So it is that we may live among some of the greatest beauties and wonders of nature, and see and know them not. So, also, matters of economic importance touching the relation of man to his setting in nature, crowd upon him from every side, often without their existence even being suspected. The eyes of the race open but slowly!

To forest-dwelling peoples—so-called "wild" peoples—these insects are well known, and this fact indicates a ready means by which great numbers of them may easily be obtained for study. Such peoples are constantly climbing the largest and tallest forest trees to obtain honey, and some even make their dwellings high in the trees. I have found Negritos, Manobos, and others well acquainted with these insects and quick to obtain them for trade or sale. As the result of a special appeal to entomologists throughout Indo-Malayan countries for material to be used in these studies, I obtained very few and very poor specimens; though even those were very thankfully received. A small number of natives in the right surroundings, on the other hand, have supplied me with rich materials, and had I the facilities for visiting such peoples at various points I am sure that extensive and highly valuable materials of this and other groups of little-known forest insects could easily be obtained. Other splendid opportunities to obtain many of these, and also other insects inhabiting the high forest, are available wherever the virgin forest is being rapidly felled, as in clearing for plantation sites. These are unexcelled opportunities for gaining knowledge of an extensive fauna that is practically inaccessible under ordinary circumstances, of which fullest advantage should be taken, on every possible occasion.

In these directions some of the greatest possibilities for the extension of knowledge of the forest entomology of the Philippines have been neglected and left undeveloped. However, it seems probable from the very little accomplished that, instead of but a few species of *Fulgora,* there are many in this Archipelago, and that many species new to science await discovery. A few of the species may be widely distributed through the Islands, but indications are that most of them may be very local in distribution. Every forested island promises to yield its quota of distinct species.

Of the genus, the first species to be described was *candelaria* from South China, made known by Linnæus in 1775. In addition, some forty-two true *Fulgora* species have been described by various authors as follows:

Donovan	1	Atkinson	1
Olivier	1	Gerstaecker	1
Westwood	4	Noualhier	1
Adams and White	1	Bierman	2
Guerin	3	Schumacher	1
Walker	1	Schmidt	8
Kirby	1	Distant	11
Stål	5		

It is probable that the largest reference collection of these forms in the world exists in the British Museum. In the present studies I have had before me thirty-five species and varieties, including some eight forms apparently new to science. All of the Philippine species described by Stål have been re-collected in connection with this work.

Most of the earlier species were very inadequately described, the diagnostic characters having been drawn from colors only, and in the few cases of illustration the figures were very inaccurate. It is true that within the genus there is a very remarkable anatomical homogeneity, the most conspicuous differences apparently occurring in the processus.[3]

This feature either has not been described, or has been described in such a manner that a clear mental picture was not possible. Accurate illustrations are a practical necessity in this genus, are of greater service than pages of involved description, and are an urgent desideratum in connection with all of the older species. In the present study this want has been supplied, so far as black and white can supply it, by natural-size photographs very kindly furnished by the Bureau of Science studio. Also, the genitalia have never been studied, and their examination promises to throw light on specific limits among the critical species, but this can only be accomplished when series of specimens are available.

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[3] I prefer to call the cephalic prolongation a "processus" rather than "horn," "cornu," "rostrum," or "process."

In color and venational characters there exists here a high degree of variability, which previous lack of large series of individuals has made impossible to estimate. The only attempts to arrange the species in groups were principally on the basis of color of hind wings; not only is this character variable and subject to considerable change during preservation, but its use throws together otherwise very diverse forms. In numbers of cases, the specimens becoming the types of older species were sent to Europe in alcohol, which may completely change the color scheme—red to ochraceous, yellow to stramineous or white, etc. In Plates 9 and 10 are shown the venational features of two closely related species (*polillensis* and *samarana*) as compared with a distantly related one (*zephyria*). In these figures the R + M stem happens to be of similar length in all. So far as these individuals are concerned, it will be noted that, in the secondary forkings of the medius, *polillensis* more closely resembles *zephyria* than it does *samarana*. Moreover, the fresh specimens may be almost completely covered with a powdery white wax secretion, obscuring the colors beneath; this, though lost later, may adhere longest to the pale spots of the tegmina and the wings, or in flecks to other portions of the body. They were often described by earlier and by some later authors as intrinsic markings.

From the first few specimens of several species which came to my hands, it seemed certain that the venation of the tegmina would furnish important classificatory characters. There was wide difference in distance from the origin of subcosta, radius, and medius to the primary and secondary forkings, and also in the relative length of the R + M stem. Additional material showed variation in these characters, but it still seemed possible to use them for specific distinction; however, when we had obtained the first series, which chanced to consist of some ten or more specimens of *effusa*, it became clear that some of the widest venational differences were to be found in different individuals of one and the same species.

The only hope for the rescue of this magnificent genus from its present somewhat chaotic condition is, first, through collection of large series of fresh specimens of both sexes, and then through illustration, and particularly illustration that will accurately show anatomical form. Colored plates from fresh material are a very great desideratum, and the publication of such plates would make a scientific event of first importance—one that would attract world-wide attention.

The present preliminary study makes no pretensions whatever to being in any wise a monographic treatment. There is at present no collection in the world adequate for such a purpose. The present object is to make known a few new forms, to compare these with related older forms, and especially to call the attention of local workers and resident entomologists throughout Indo-Malayan countries to the great importance of making new collections of large series of all species in all regions. Only such procedure will prepare the way for the proper monographic revision that is so urgently needed in this, one of the most conspicuous and interesting groups of insects in the world.

In connection with the present study, I take pleasure in acknowledging the kindness of various persons in contributing specimens for study purposes, particularly Edmund Schmidt, Konservator, Stettin Museum; the late Doctor Annandale, of the Indian Museum; Doctor Karny, of Buitenzorg; and Mr. C. Boden-Kloss, of the Raffles Museum.

The material now in hand is arranged in my collection in several groups of species as follows:[4]

1. THE CANDELARIA GROUP

This group includes the larger number of the most characteristic species of the genus. The processus is long, slender, varying from strongly upcurved apically to obliquely nearly straight, shallow vertically, apically commonly more or less compressed, and without or with a very slight indication of swelling at apex. The forewings are of varying dimensions and both tegmina and wings are very variously colored. All are medium-sized to small species.

2. THE PYRORHYNCHA GROUP

A group of species clearly related to what I have determined as *pyrorhyncha*. They are large, stout, elongate species with long stout processus of more or less equal width and depth in distal four-fifths, the upper margin in side view bent a little beyond middle; beyond this bend the processus is elongately somewhat inflated for the remainder of its length, and is deeper on this apical portion than at base. The anteocular vertical carina, above, not only meets the lateral carina of vertex above, but extends somewhat beyond it on to disk of vertex, a character not noted in any other group. The general color impression is castaneous to ochraceous. The forewings lack sharply contrasting markings; the hind wings are bluish at base, with broadly black apices.

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[4] This is distinctly not a proposal for the arrangement of all the species of the genus, a number of which I have not yet seen; it is only an attempt to arrange the material in hand, but it certainly represents a far more natural grouping for the species concerned than one based on the color of the hind wings.

3. THE SULTANA GROUP

Here are included the huge, largely red species related to *sultana,* the giants of the genus. In all of them the vertex is large and broad and narrows very gradually into the long, deep, and apically compressed processus, which is ensiform or falcately upcurved. In all of the forms before me, the head and thorax are uniformly deep red above and uniformly ochraceous below. These species are the largest and most conspicuous in the genus, but among the most difficult to obtain and to distinguish, and large series are greatly needed. Fresh specimens are commonly completely enveloped with a closely adhering farinose layer of white wax.

4. THE EFFUSA GROUP

The species of this group all have very short but not very stout processus, in most cases strongly bent or curved upward, and wholly or in part brilliant blue-green. In all species the processus is apically more or less distinctly swollen or vertically expanded. In all the tegmina are greenish basally, with various yellowish dots or markings, and castaneous apically; the hind wings are blue basally and broadly black apically. Size medium to small.

5. THE CLAVATA GROUP

Including species related to the well-known Indian species *clavata,* with short, very stout, and strongly clavate processus, which is black or olive green above, and with red or ochraceous apex. Tegmina largely black. Species of medium size.

Key to species of the candelaria group of Fulgora.

a^1. Processus strongly falcately upcurved, distinctly compressed apically (usually including apex).
  b^1. Hind wings with broad black apices.
    c^1. Basal two-thirds of entire wing chrome yellow.

*d*¹. Processus castaneo-ochraceous to greenish, concolorous; basal spots on tegmina amalgamated into more or less complete transverse bands.

*e*¹. Larger with longer processus (52 to 53 millimeters long, of which processus is 18 millimeters); tegmina longer in proportion to width........ **F. candelaria** Linnæus.

*e*². Smaller, with short, slender processus (40 to 43 millimeters long, of which processus is 14 millimeters);[5] tegmina shorter in proportion to width........ **F. viridirostris** Westwood.

*d*². Processus black above, mesonotum largely black.

*e*¹. Processus concolorous above; basal spots of tegmina amalgamated into more or less complete transverse bands; apical spots few........ **F. spinolae** Westwood.

*e*². Processus pale green at apex; the round spots of tegmina well separated, numerous, pale ringed........ **F. lathburii** Kirby.

*c*². Basal area of wings blue.

*d*¹. Tegmina pale castaneous with yellowish veins and spots; processus greenish to ochraceous........ **F. delesserti** Guerin.

*d*². Tegmina black, with white to pale bluish veins and spots; processus and thorax above deep olive green to blackish. **F. maculata** Olivier.

*b*². Hind wings whitish throughout, with at most a small carmine area before costal margin, this sometimes with a small smoky area adjoining it distally.

*c*¹. Wings with carmine spot and reddish veins; tegmina of usual proportions.

*d*¹. With small lateral black spots on pronotum and mesonotum; size smaller........ **F. oculata** Westwood.

*d*². Without black marks on thorax; size larger. **F. subocellata** Guerin.

*c*². Wings, with veins, white throughout; thorax heavily marked with black; tegmina with a series of small black spots about entire periphery; tegmina unusually short and broad. **F. agusanensis** sp. nov.

*a*². Processus obliquely straight, little if any curved, and usually little if any compressed apically, the apex usually slightly swollen.

*b*¹. Wings chrome yellow, with narrow apical border black. **F. philippina** Stål.

*b*². Wings deep blue or white at base.

*c*¹. Wings deep blue at base, broadly black apically; tegmina with transverse yellowish spots basally, with round spots apically; strongly colored throughout.

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[5] All measurements of length given in this paper are taken in only one way. Total length is measured at the side, from apex of processus to apex of closed tegmina. Length of head is taken at side, from extreme apex of processus, straight to the postocular carina, disregarding any curve of the processus. A length measurement taken to apex of abdomen, as given by some authors, cannot but be very inexact, due to the very variable shrinkage of the abdomen in drying.

d^1. Thorax without black spots above; head and thorax castaneous; apex of processus pale, size large (? = *stellata* Butler).
F. intricata Walker.

d^2. Pronotum yellowish, mesonotum castaneous with black spots to entirely black; processus vivid green throughout.
  e^1. Processus long; pronotum without black; mesonotum castaneous with two black lateral dots; cross veins in tegmina very delicate and inconspicuous.................. **F. aeruginosa** Stål.
  e^2. Processus shorter; pronotum apically and nearly entire mesonotum black; cross veins in tegmina strong and conspicuous.
F. maquilingana sp. nov.

c^2. Wings very pale blue to white basally; general color scheme pale greenish ochraceous to pale smoky castaneous; tegmina without yellow spots, at most with very pale whitish or pellucid discal spots; with marginal quadrangular darker spots or pale greenish bands.
  d^1. Tegmina with irregular pale greenish transverse bands or spots basally, and without dark quadrangular marginal spots; size small; processus slender................................ **F. heringi** Schmidt.
  d^2. Tegmina without greenish transverse bands or spots, but with costal and claval quadrangular dark spots, two or three in clavus, and two to four in costal area; processus stout.
    e^1. Hind wings with very broad apical and anal margins black.
F. fumosa sp. nov.
    e^2. Hind wings with only a transverse subapical black band.
F. lauta Stål.
    e^3. Hind wings without apical black band...... **F. zephyria** Schmidt.

Fulgora candelaria Linnæus. Plate 3, fig. 1; Plate 4, fig. 5.

This characteristic South China species is the type and best-known species of the genus. It is distributed throughout South China, Indo-China, and Siam. In South China, where the virgin forests have long since been removed, this species seems to have thriven under the completely changed conditions and is sometimes abundant even among low shrubbery, where it may be taken with ease. The specimens used for the present illustration were taken at Foochow (*Gardner*).

Fulgora viridirostris Westwood.

Closely resembling *F. candelaria,* this smaller Indian species differs clearly in the relative dimensions of the tegmina, which are shorter in proportion to width; greatest width into length nearly three times in *candelaria,* about two and a half times in *viridirostris.* The distinction given by Distant[6] will probably not hold in fresh specimens. Doctor Annandale sent me specimens taken in Sikkim and in Upper Assam (*H. Stevens*).

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[6] Fauna Brit. Ind. Rhynch. 3 (1906) 185.

Fulgora spinolae Westwood.

A larger and more deeply colored species than *F. candelaria* but with very similar form and markings, though there are fewer spots on the apical area of the tegmina. Both head and thorax are heavily marked with black. Said to be distributed from South China and Tonkin through to northeastern India. Doctor Annandale sent me specimens taken by himself in Kurseong.

Fulgora lathburii Kirby. Plate 3, fig. 2; Plate 4, fig. 6.

This fine species with the conspicuous tegminal spots is said to be distributed from Hongkong to Sylhet. My specimens were taken in Hongkong and very kindly sent to me by Miss Fountaine, the English lepidopterological collector, who is known through her world-wide activities, and who spent some time in the Philippines.

Fulgora philippina Stål. Plate 1, fig. 5; Plate 2, fig. 3.

Of Philippine species, this one with yellow hind wings shows most resemblance to species of South China and Borneo, though, like other Philippine species, it possesses a distinct type of processus. It has not been brought to notice since its original description in 1870 [7] from specimens sent to Sweden by Semper, who probably obtained them in Surigao. I have found it not uncommon in the forests of Samar Island.

The basic membrane color on the basal three-fourths of the tegmina is greenish to ochraceous, whereas on the apical area the membrane is black, though the veins throughout are greenish.[8] This is clearly shown in the illustration and is a reversal of the order in certain other species.

Fulgora intricata Walker. Plate 3, fig. 3; Plate 4, fig. 9.

Although the *F. stellata* of Butler is said to be a straight synonym of *intricata,* still the specimen before me appears to fit the description of *stellata* better than that of *intricata.* It is therefore necessary to inquire if there is not really at least a varietal distinction here. The present specimen, sent by Mr. C. Boden-Kloss, is from Trusan, Sarawak (*H. W. Smith*). *Ful-*

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[7] Ofv. Vet. Ak. Forh. (1870) 740.

[8] The color of the crowded veins frequently furnishes the color effect of the tegmina as a whole, the basic membrane color being noted by some authors as "color of cells," so that the same species may be described as having tegmina ochraceous with dark cells, or as smoky with ochraceous veins.

gora intricata was originally described from Sarawak and *stellata* from Labuan Island.

While the tegminal marking is similar to that of *philippina*, the coloration of the wing is totally different, being bright blue at base, apically very broadly black. In side view the processus resembles somewhat that of the *pyrorhyncha* group, but in dorsal view it gradually narrows from base to apex. The actual relationship of this species is probably with the *effusa* group, but because of the far greater length of head, and until more material is obtained, it is placed here.

The length of the present specimen is 62 millimeters; head, 10.

Fulgora aeruginosa Stål. Plate 2, fig. 5 (female), fig. 6 (male).

This, the second Philippine species, has likewise not been noticed since the time of its description in 1870. Whereas the original specimens collected by Semper probably came from northeastern Mindanao, my specimens are from the Zamboanga Peninsula.

A female specimen before me has a length of 47 millimeters; head, 15. While the tegminal markings are of the type of *F. intricata* and *philippina*, with basal spots anastomosed into transverse bands, still a marked difference occurs in the fact that distinctly transverse spots occur to three-fourths of the tegminal length, and the terminal round spots are few and may be very regularly arranged within the apical margin. The ochraceous pronotum contrasts with the castaneous mesonotum as in some specimens of *philippina*. The blue basal field of the hind wings is very restricted, since the apical black extends broadly along the entire anal margin.

Fulgora maquilingana sp. nov. Plate 2, fig. 7.

In central Luzon, on Mount Maquiling, is found a species very similar to the Mindanao *aeruginosa* in color and markings, but smaller and with a very different processus.

Length of male, 33 millimeters; head, 10. The processus is straight, as viewed from the side, extending obliquely upward at an angle of 45°, apex a little swollen, pale green beyond eyes; face ochraceous. A median stripe on clypeus, sternum medially, all femora, and hind tibiæ and tarsi castaneous; fore and middle tibiæ and tarsi blackish. Abdomen black, hind margins of segments paler. Most of pronotum pale yellow, its fore border and the mesonotum very dark castaneous, in sharper contrast than in *aeruginosa*. Tegminal basic membrane color greenish on basal half, blackish on apical half, veins greenish to ochraceous; yellow markings similar to those of *aeruginosa, philippina,* and *intricata,* but spots not transverse beyond middle. Basal blue of wing more extensive and more sharply outlined than in *aeruginosa,* the apical black rapidly narrowing on anal margin and not extended inwardly along the veins as in *aeruginosa.*

Fulgora delesserti Guerin. Plate 3, fig. 6; Plate 4, fig. 4.

Structurally this species is very closely related to *F. viridirostris* of northern India and Burma, and represents that species in southern India. Whereas the basal area of the wing is yellow in *viridirostris,* in the present species it is pale blue. Unlike *viridirostris,* this species has only the basal row of tegminal spots united into a transverse band, most of the remaining large round dark yellow spots being separated. The tegminal membrane varies from black basally to smoky apically, the veins being ochraceous.

Doctor Annandale sent me a male specimen from Trivandrum, of which the total length is 44 millimeters; head, 13.

Fulgora maculata Olivier.

This almost wholly black species, with pale tegminal spots and blue wing base, is one of the better-known *Fulgora* species, and is characteristic of the Ceylon fauna. The pale tegminal spots are commonly coated with farinose white wax, thus making them very conspicuous on the black background. The processus is very strongly upcurved, as in *F. agusanensis* sp. nov., and is similar in structure but not so long.

Doctor Annandale sent me Ceylon specimens collected by A. B. Cornelius.

Fulgora subocellata Guerin.
Fulgora oculata Westwood.

Although the latter species is usually referred to the former as a variety, this reference seems doubtful. *Fulgora oculata* is supposed to be generally distributed throughout Indo-Malayan countries. So far as I know, *subocellata* has been recorded only from the Malay Peninsula. What I take to be *oculata* is illustrated herein on Plate 8, fig. 5; the side view, on Plate 8, fig. 6; and a supposed *subocellata,* on Plate 8, figs. 3 and 4. Of the former, the specimen illustrated is from the Malabar Coast (*Annandale*), and of the latter from Sumatra (*Corporaal*). It will be noted that there is considerable difference in the proportions of the processus and of the body. The two forms are similarly pale castaneous and ochraceous in general color scheme, with small ocellated tegminal spots, and a dash of carmine within the middle of the costal area of the otherwise white wing—the carmine sometimes outwardly bordered more or less with smoky.

These forms, as they stand to-day, are good evidence of the great need of large study series from all regions. Only through such material can come any clear understanding of the limits of species and varieties.

Fulgora agusanensis sp. nov. Plate 1, fig. 6; Plate 4, fig. 2.

This species, unique among *Fulgora* species known to me, comes from Agusan Valley, northeastern Mindanao. It possesses very broad and short tegmina, and the very long and slender processus is strongly curved.

Length of male, 48 millimeters; head, in straight line from apex to postocular margin, 16; measured along the curve, 20; length of tegmina, 30; width at broadest part, 13. Body ochraceous, head and thorax above medially piceous, also piceous are spots on temples in front of eyes, a small dash below and behind eyes, an oblique stripe on propleuræ, three dots at articulation of tegmen, two lateral spots on mesonotum, fore and middle tibiæ (largely), and tarsi; apices of hind tibiæ with their tarsi darkened.

The tegmina are pale greenish ochraceous, veins concolorous, with numerous shadowy, more or less evenly distributed round spots which are ocellated with paler margins. Around the marginal periphery of tegmina are about twelve irregular black spots, the black invading the membrane only, not the veins; four of these occur on the costal margin, four on the apical margin, and four on the claval margin. The hind wings are clear white throughout.

Fulgora heringi Schmidt.

This little gem of a *Fulgora,* as unique in its way as *agusanensis,* was described in 1905 from North Borneo.[9] Konservator Schmidt of the Stettin Museum has kindly sent a specimen to me. It is a small, beautifully pale green form, with two slightly darker green, irregular transverse bands on tegmina; wings pale blue basally, apically broadly, and anally narrowly, margined with smoky. It may well stand near *zephyria* Schmidt, of similar general coloration and form.

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[9] Stett. Ent. Zeit. 66 (1905) 351.

Fulgora fumosa sp. nov. Plate 5, fig. 4; Plate 7, fig. 4.

This very distinct species which I have recently obtained from the eastern forests of Samar Island, is evidently related to *lauta* and *zephyria,* being of similar size, form, and pattern of marking. Female, length, 56 millimeters; head, 9. Head pale sordid olive green above, ochraceous below; thorax ochraceous. Abdomen ochraceous, all of the segments above and the terminal ones below clouded with blackish. Areas before and behind eyes and two small lateral spots on mesonotum black. Tegmina pale greenish ochraceous, somewhat smoky on apical third, with two quadrangular darker spots on costal area at middle and two similar spots on claval area; a few pale dots on apical area. Wing white basally, broadly black at apex, the black broadly extended about anal margin and there becoming somewhat diffuse. Legs ochraceous, tibiæ and tarsi black, femora a little blackened at apex. The form of the processus is well shown in the figures.

Fulgora lauta Stål. Plate 1, fig. 4; Plate 4, fig. 3.

Another of Stål's Philippine species, which has not been noticed since the original description in 1870. This is one of the most delicately colored of Philippine species, the general shade being a very pale castaneous. There are four quadrangular castaneous spots in costal area of tegmina and two in claval area, the remainder of the tegmina with numerous pale and inconspicuous dots and spots of varying size. The white hind wing with a subapical black band is characteristic. The specimen illustrated is from Mount Maquiling, central Luzon; its length is 53 millimeters; head, 7.

Fulgora zephyria Schmidt. Plate 1, fig. 3; Plate 2, fig. 4; Plate 9, fig. 3; Plate 10, fig. 3.

This species, confined to Polillo Island, was described in 1907 by Schmidt.[10] I have since taken a good series in the forests of central Polillo. It is very similar to *lauta* in form and tegminal markings, but stouter, and the females are larger.

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[10] Stett. Ent. Zeit. 68 (1907) 322.

The general color effect is greenish ochraceous, but the marginal quadrangular spots are rather deep green, interspaces between these spots, and the tegmina apically, more distinctly ochraceous. Length of female, 58 millimeters; head, 19; male, 51; head, 17.

In the original description, Schmidt did not mention the very close relationship of this species to *lauta* Stål.

Key to species of the pyrorhyncha group of Fulgora.

a^1. Head above, except apex, dark castaneous to blackish; blackish areas on pronotum and median field of mesonotum; processus not distinctly bent just beyond middle on upper surface; total length of head (side view) somewhat more than half remaining length (to apices of closed tegmina); a very large species.................................. **F. pyrorhyncha** Don.

a^2. Head above pale castaneous to greenish; mesonotum without black; processus distinctly bent just beyond middle on upper surface; length of head (side view) somewhat less than half remaining length (to apices of closed tegmina); medium-sized species.

  b^1. Tegmina without large reddish subapical area; basal and apical fields without distinct small yellow spots.......................... **F. pythica** Distant.

  b^2. Tegmina with a large reddish subapical area, both basal and apical areas with distinct small yellow spots................ **F. incerta** Schmidt.

Fulgora pyrorhyncha Don. Plate 5, fig. 1; Plate 7, fig. 5.

No group of *Fulgora* more urgently needs comprehensive collecting of large series than that of *pyrorhyncha* and its allies. Museum specimens appear to be usually faded, and the "worse for wear." This is a group of large coarse species which are undoubtedly strong and active fliers. The general color effect is castaneous, the tegmina with very few and inconspicuous markings. The basic membrane of the tegmina is more or less blackened on basal half and on apical fourth, the veins castaneous to yellowish (*incerta*). The blue basal area of the wings is very restricted, the apical half of the wings (broadly on anal area) being black.

I do not know that I have correctly determined *pyrorhyncha*, but a specimen from the Raffles Museum, labeled Perak, cannot be referred elsewhere. The head is very dark castaneous, blackish above in part, and the slightly swollen apex of the processus is deep red; also, the processus is sprinkled with flecks of white wax. The third fourth of tegmina is paler and with a few round spots of varying size. Thorax and legs dark castaneous. Abdomen black, segments with ochraceous margins. Female, length, 73 millimeters; head, 24.

It apears that this species is confined to the Malay Peninsula.

Fulgora pythica Distant. Plate 5, figs. 2, 5; Plate 7, figs. 2, 3.

This species was described by Distant, without definite locality, in 1891,[11] but was afterward recorded from Sumatra by Schmidt and by Bierman. A single female specimen before me (Plate 5, fig. 2; Plate 7, fig. 2), from North Borneo, cannot at present be referred elsewhere. Another specimen (Plate 5, fig. 5; Plate 7, fig. 3), sent to me by Doctor Karny and labeled New Guinea (doubtless in error), is a male of the same species. These specimens are very similar to *pyrorhyncha,* but have the processus distinctly bent on upper surface beyond middle (see lateral view).

Fulgora incerta Schmidt. Plate 5, fig. 3; Plate 7, fig. 1.

This species from Sumatra, a specimen of which (coll. Dohrn) was kindly sent to me by Konservator Schmidt, of the Stettin Museum, is a close relative of *pyrorhyncha* and *pythica.* Its anatomical features are quite those of *pythica.*

The apex of the processus is bright yellow, in striking contrast to the preceding olive green. The veins of the tegmina are bright yellow, in striking contrast to the blackish membrane beneath. The third fourth of the tegmina, which in all species of this group has the basic membrane decolored, is here rose red.

The *Fulgora dohrni* of Schmidt, also from Sumatra, and apparently also pertaining to this group, is unknown to me.

Key to species of the sultana group of Fulgora.

*a*¹. Processus evenly and gradually ensiform from base to apex (in side view), the apex evenly porrect or slightly upturned.
  *b*¹. The blackened membrane of basal half of tegmina with two transverse rows of several large round pale reddish spots, which may be more or less joined into transverse bands; apex of processus evenly porrect.. **F. sultana** Adams and White.
  *b*². The blackened membrane of basal half of tegmina without spots and the black intense; apex of processus a little upturned. **F. basinigra** Schmidt.
*a*². Processus suddenly and strongly falcately upcurved from beyond middle. **F. erecta** Schmidt.

Fulgora sultana Adams and White. Plate 5, fig. 6; Plate 6, figs. 2, 3.

The huge red species of this group are the finest of the genus, and may well be counted among the finest of Malayan insects. They apparently are rarely represented in collections, and large series of all the species are needed for any clear understanding of them. Their prevailing color is red or reddish castaneous. The apical third of the tegmina is smoky, and the apical third of the wing smoky to black; both of these areas may be decorated with round cretaceous white spots which, however, may reveal hardly perceptible spots when the farinose wax is rubbed off. In nature these species are commonly almost buried in copious white wax secretions on all parts of the body, though especially copious on the abdomen—so abundant and so constant, in fact, that they may furnish the nidus and food for various very peculiar lepidopterous larvæ.[12]

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[11] Trans. Ent. Soc. London (1891) 517, pl. 20, fig. 3.

The specimens illustrated herein as *sultana* were taken by me in British North Borneo; Plate 6, fig. 3, shows the flaring tegmina in a state of rest. Length, 70 to 75 millimeters; head, 22. The basic membrane of the basal two-thirds of the tegmina blackish, and bearing three obscure rows of large reddish spots, the largest at the extreme base. In 1847 Butler[13] described a form from Sarawak as *F. gigantea*. Schmidt considered this a straight synonym of *sultana*, but Kirkaldly[14] in 1902 maintains that it is distinct and gives various characters to distinguish it, though some of the characters mentioned have no diagnostic value. Such questions cannot be conclusively settled without far more material than is at present available.

Fulgora basinigra Schmidt. Plate 5, fig. 7; Plate 6, fig. 4.

A female cotype of this very conspicuous form from North Borneo (*Waterstradt*) has been sent to me by Konservator Schmidt, of the Stettin Museum. It is very close to *sultana*, except that it is slightly smaller (length, 67 millimeters; head, 11); the basic black of the tegmina has run together in solid and very intense color only relieved by the reddish veins, and the apex of the processus is a little upturned in lateral view.

Fulgora erecta Schmidt. Plate 5, fig. 8; Plate 6, fig. 1; Plate 8, figs. 1, 2.

A Java specimen, sent to me by Doctor Karny, appears to be this species. The apical two-fifths of the processus is strongly upturned. An irregular darker line separates the basal red from the apical smoky area in both tegmina and wings. Ill-defined pale spots are visible, as shown in Plate 6, fig. 1.

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[12] Also true of various other Fulgoroidea in Oriental countries.

[13] Proc. Zool. Soc. London (1847) 7, 99, t. 15, fig. 2.

[14] Journ. Bombay Nat. Hist. Soc. 14 (1902) 47.

Most of the basic membrane of the basal two-thirds of the tegmina is deep red, with the veins concolorous, a little smoky basic color appearing in the apical portion of this area. The female illustrated measures, in total length, 63 millimeters; head, 20.

A very similar female specimen, also sent by Doctor Karny from Java, is closely similar to the above specimen of *erecta,* except that it is somewhat smaller, and the slenderer processus has fully the apical half suddenly upturned (Plate 8, figs. 1, 2). For the present I am designating this as var. *occulta* var. nov.

Key to species of the effusa group of Fulgora.

a^1. Size medium; tegmina with numerous scattering yellow spots, but no transverse yellow stripe at middle; processus strongly and suddenly upcurved from middle.
  b^1. Head vivid green; tegmina with six to eight distinct yellow spots on apical third; spots on basal area round and well separated. **F. effusa** Distant.
  b^2. Head bright castaneous on basal half; tegmina with no yellow spots on the bright castaneous apical area; spots on basal area transverse........ **F. viridicastanea sp. nov.**
a^2. Size very small, *Saiva*-like; tegmina with a sharp and complete transverse yellow stripe just before middle, with very few spots either before or behind it; basic membrane color on basal two-thirds clear leaf green, the veins concolorous; processus very slightly bent at middle, apex ochraceous, in sharp contrast to preceding green. **F. transversolineata sp. nov.**

Fulgora effusa Distant. Plate 3, fig. 4; Plate 4, fig. 7.

This species was described by Distant [15] in 1891 from Bornean specimens without further localization. I have taken a series of specimens in British North Borneo, which very closely fit the description, and especially the figure of the species. I am not, however, able to compare it with the closely related *F. whiteheadi* Distant, with which Distant compares *effusa.* A character not mentioned by Distant, but clear from my specimens and his figures, is that the blackish basic membrane color of the basal area shades gradually into the apical smoky, with no indication of transverse demarcation between. The color of the processus varies in dried specimens from ochraceous to bright green.

Fulgora viridicastanea sp. nov. Plate 3, fig. 5; Plate 4, fig. 8.

A specimen from Bandjermassin, South Borneo, indicates a form quite distinct from the above, but closely related. Distant states that *effusa* has the apex of the processus more swollen than in *whiteheadi.* My specimens, determined as *effusa,* agree well with Distant's figure in this respect. This South Bornean form, however, has the apical half even much more swollen than in *effusa* and cannot, therefore, be *whiteheadi,* although the processus is bicolored, as described for *effusa,* though this may be a plastic character.

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[15] Trans. Ent. Soc. London (1891) 518, pl. 20, fig. 4.

Male, length, 43 millimeters; head, 11. Basal half of head, thorax, and legs pale castaneous to ochraceous, apical half of processus bright green. Tegmina as in *effusa,* but there are no distinct spots on apical half. Hind wings as in *effusa,* but the blue basal area is more restricted.

Fulgora transversolineata sp. nov. Plate 6, fig. 5; Plate 8, fig. 7.

In British North Borneo forests I have taken a very small *Fulgora,* which at first seemed doubtfully to pertain to this genus. The processus is rather slender, as seen from above, the head rapidly narrowing in front of the eyes. This is a character of the genus *Saiva,* an Indian species of which (*S. cardinalis* Butler) is illustrated herein for comparison (Plate 7, fig. 6; Plate 8, fig. 8). It may be noted that several species of *Saiva* have been recorded from Borneo. It can also be compared with another genus of small-sized relatives which possess a rapidly narrowing head—*Prolepta*—of which one species (*P. apicalis* Westwood) is common in the Philippines and is illustrated herein (Plate 7, fig. 7; Plate 8, fig. 9). However, by comparison also, it will be seen that the narrowing of the head in this North Bornean species is actually not more sudden than in *F. delesserti* or *F. maquilingana,* though its very small size tends to make it appear so. Also, its processus is somewhat swollen at the apex, a character supposed not to occur in true *Saiva.* The form of the tegmina apically somewhat resembles that in *Saiva,* but this also may be duplicated among true *Fulgora.* In the side view (Plate 8, fig. 7) it will be noted that the form of the head would be not greatly unlike a diminutive *F. effusa* (Plate 4, fig. 7). Therefore, for the present it is placed in true *Fulgora.*

Male, length, 28 millimeters; head, 7. Head ochraceous at base and apex, median portion clear greenish. Thorax and legs pale castaneous, ridges of tibiæ blackened. Abdomen black above, margins of segments narrowly ochraceous, below pale castaneous. Basal two-thirds of tegmina clear leaf green, the veins concolorous, the apical third pale castaneous, the veins also concolorous here; at about middle of tegmina there is a complete, narrow, sharp-cut, straight, transverse yellow stripe; a very few small yellowish dots occur before and beyond this transverse stripe. I also have a female of this species, slightly larger but not unlike otherwise, of which however length measurements cannot be taken, as the processus is broken.

Key to species of the clavata group of Fulgora.

a^1. Processus black, slender between base and the clavate apex, the latter deep red; ground color of tegmina black; markings appearing as black spots set in irregular pale areas; hind wing nearly white, with broadly black apex........ **F. clavata** Westwood.

a^2. Processus sordid olive green of varying shades, the apex ochraceous, much stouter at middle than in *clavata* and somewhat shorter; hind wings blue or deep blue-green at base, the apical black extended over anal margin; tegmina with small rounded pale spots.

- b^1. Tegmina black, veins inconspicuously pale on basal area, no spots on apical area; basal area of hind wings bright blue, anal black border rapidly narrowed........ **F. polillensis** sp. nov.
- b^2. Tegmina olive green, apically narrowly bordered with castaneous to black, veins conspicuously pale basally; hind wings with anal area smaller, greenish blue, the anal black border very broad. **F. samarana** sp. nov.

Fulgora clavata Westwood. Plate 4, fig. 1.

This North Indian species with short but very strongly clavate head, and the tegmina usually thickly covered with farinose wax secretion in fresh specimens, is well known. Divested of the wax, the tegmina are blackish, extensively mottled with pale areas and spots. The large swollen apex of processus is blood red, the remainder of its upper surface black; just proximad of the bulbous apex the processus is rather slender. Doctor Annandale sent me specimens of this species from Garo Hills, Assam (*S. Kemp*).

Fulgora polillensis sp. nov. Plate 1, fig. 2; Plate 2, fig. 2; Plate 9, fig. 1; Plate 10, fig. 1.

It is a remarkable occurrence that two large and striking, closely related species resembling *clavata* should now turn up on the extreme eastern periphery of the Philippine Archipelago, when intervening countries have not yet yielded species of this type. More comprehensive collecting will undoubtedly bring to light a number more from Malaya. In the two new species the processus is far more massive than in *clavata,* though of no greater length. It is also commonly borne in a somewhat more strongly oblique position, in the living insects. Both of the new species differ widely in the color scheme of the hind wings.

The first of these species is common in the forests of central Polillo.

Female, length, 53 to 55 millimeters; head, 6 to 7; male, 48; head, 6. Head above sordid olive green, the apex and all below ochraceous. Thorax ochraceous, two small lateral dots on mesonotum black. Abdomen ochraceous, segments distally becoming blackish. Femora castaneous, tibiæ and tarsi piceous. Tegmina black, veins on basal half pale greenish, on apical half concolorous; basal half crossed by about three equidistant rows of round pale greenish spots, three or four spots in each row; apical black portion immaculate. Hind wing broadly blue on basal area, the very broad black of apex rapidly narrowing on anal margin. The form of the processus is clearly shown in the figures. Tegmina, thorax, and abdomen usually covered with white powdery wax in fresh specimens.

Fulgora samarana sp. nov. Plate 1, fig. 1; Plate 2, fig. 1; Plate 9, fig. 2; Plate 10, fig. 2.

Far south of Polillo, in the forests on the eastern side of Samar Island,[16] exists a species, evidently of the closest relationship with *F. polillensis*, but quite distinct by various conspicuous characters. In this case, also, a considerable series has been available for study.

Form and dimensions nearly the same as in *polillensis*, though the processus is somewhat more massive even than in that species. Also, the tegmina are somewhat narrower in proportion to the length. Color of body same as in *polillensis*. Legs castaneous, except tarsi, which are piceous or blackish. The tegmina of fresh specimens are smooth and shining, contrasting with the rather opaque surface in *polillensis*, and not covered with farinose wax, as in that species.[17] Basic color of tegminal membrane smoky on basal three-fourths, with a large area at extreme base and veins shining green; with pale spots arranged somewhat as in *polillensis*, but smaller and not so numerous; apical fourth pale castaneous with concolorous veins; apical third with a few small pale dots. Hind wings with the blue basal area considerably restricted, the black of apex extending broadly across anal area and inwardly along some of the veins.

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[16] It will be extremely interesting to secure the corresponding form from the intervening Catanduanes Island.

[17] True of all the specimens taken.

ILLUSTRATIONS

[From photographs by Cortes, Bureau of Science. The figures on Plate 9 are reduced one-seventh; all others are actual size.]

PLATE 1

FIG. 1. *Fulgora samarana* sp. nov.
2. *Fulgora polillensis* sp. nov.
3. *Fulgora zephyria* Schmidt.
4. *Fulgora lauta* Stål.
5. *Fulgora philippina* Stål.
6. *Fulgora agusanensis* sp. nov.

PLATE 2

FIG. 1. *Fulgora samarana* sp. nov.
2. *Fulgora polillensis* sp. nov.
3. *Fulgora philippina* Stål.
4. *Fulgora zephyria* Schmidt.
5. *Fulgora aeruginosa* Stål, female.
6. *Fulgora aeruginosa* Stål, male.
7. *Fulgora maquilingana* sp. nov.

PLATE 3

FIG. 1. *Fulgora candelaria* Linnæus.
2. *Fulgora lathburii* Kirby.
3. *Fulgora intricata* Walker (? = *stellata* Butler).
4. *Fulgora effusa* Distant.
5. *Fulgora viridicastanea* sp. nov.
6. *Fulgora delesserti* Guerin.

PLATE 4

FIG. 1. *Fulgora clavata* Westwood.
2. *Fulgora agusanensis* sp. nov.
3. *Fulgora lauta* Stål.
4. *Fulgora delesserti* Guerin.
5. *Fulgora candelaria* Linnæus.
6. *Fulgora lathburii* Kirby.
7. *Fulgora effusa* Distant.
8. *Fulgora viridicastanea* sp. nov.
9. *Fulgora intricata* Walker (? = *stellata* Butler).

PLATE 5

FIG. 1. *Fulgora pyrorhyncha* Don.
2. *Fulgora pythica* Distant, female.
3. *Fulgora incerta* Schmidt.
4. *Fulgora fumosa* sp. nov.

FIG. 5. *Fulgora pythica* Distant, male.
6. *Fulgora sultana* Adams and White.
7. *Fulgora basinigra* Schmidt.
8. *Fulgora erecta* Schmidt.

PLATE 6

FIG. 1. *Fulgora erecta* Schmidt.
2. *Fulgora sultana* Adams and White.
3. *Fulgora sultana* Adams and White.
4. *Fulgora basinigra* Schmidt.
5. *Fulgora transversolineata* sp. nov.

PLATE 7

FIG. 1. *Fulgora incerta* Schmidt.
2. *Fulgora pythica* Distant, female.
3. *Fulgora pythica* Distant, male.
4. *Fulgora fumosa* sp. nov.
5. *Fulgora pyrorhyncha* Don.
6. *Saiva cardinalis* Butler.
7. *Prolepta* (*Cynthila*) *apicalis* Westwood.

PLATE 8

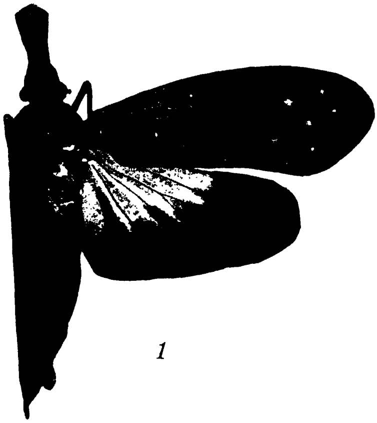
FIG. 1. *Fulgora erecta* Schmidt.
2. *Fulgora erecta* Schmidt.
3. *Fulgora subocellata* Guerin (?).
4. *Fulgora subocellata* Guerin (?).
5. *Fulgora oculata* Westwood.
6. *Fulgora oculata* Westwood.
7. *Fulgora transversolineata* sp. nov.
8. *Saiva cardinalis* Butler.
9. *Prolepta* (*Cynthila*) *apicalis* Westwood.

PLATE 9

FIG. 1. *Fulgora polillensis* sp. nov., tegmen.
2. *Fulgora samarana* sp. nov., tegmen.
3. *Fulgora zephyria* Schmidt, tegmen.

PLATE 10

FIG. 1. *Fulgora polillensis* sp. nov., hind wing.
2. *Fulgora samarana* sp. nov., hind wing.
3. *Fulgora zephyria* Schmidt, hind wing.



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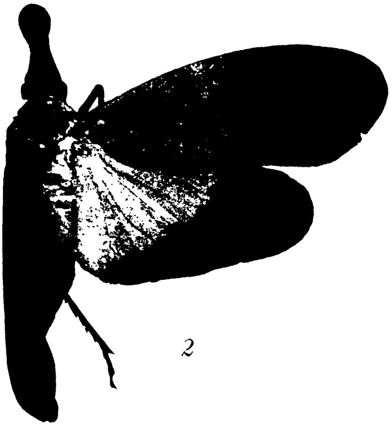

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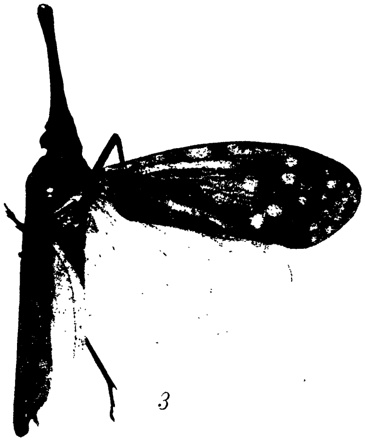

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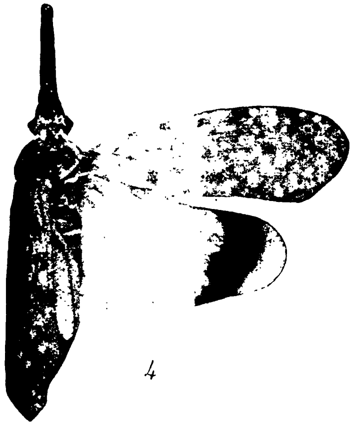

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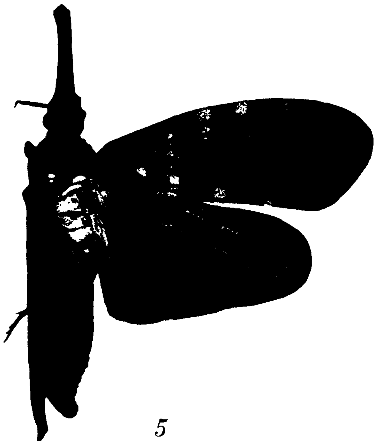

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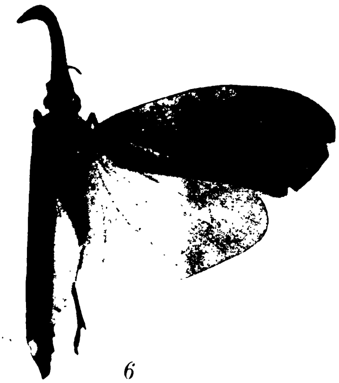

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PLATE 1.

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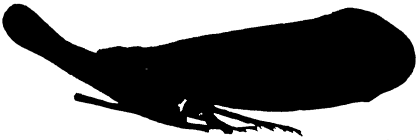
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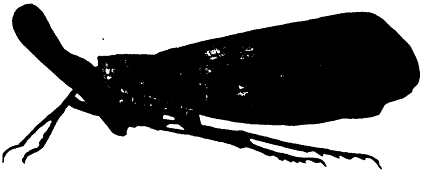
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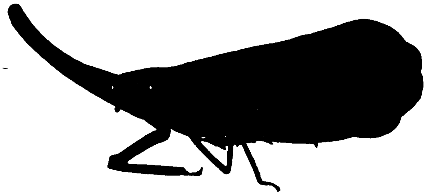
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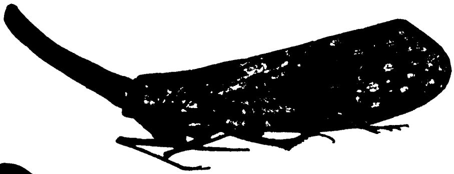
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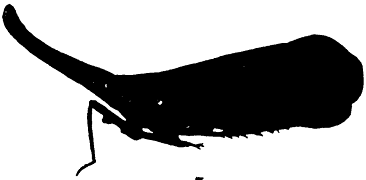
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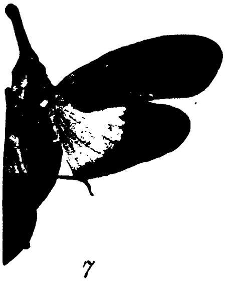
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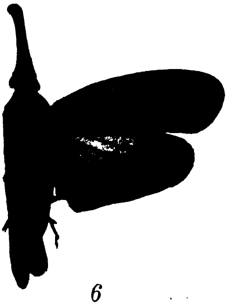
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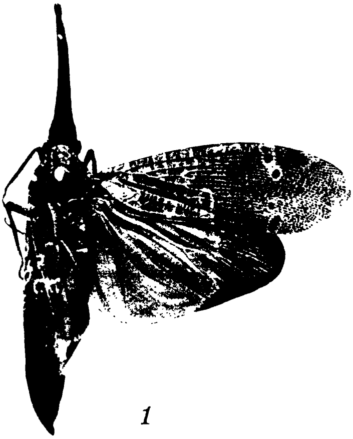

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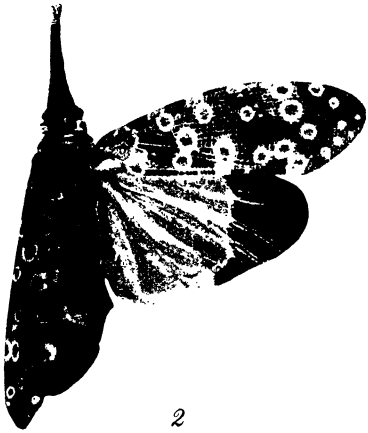

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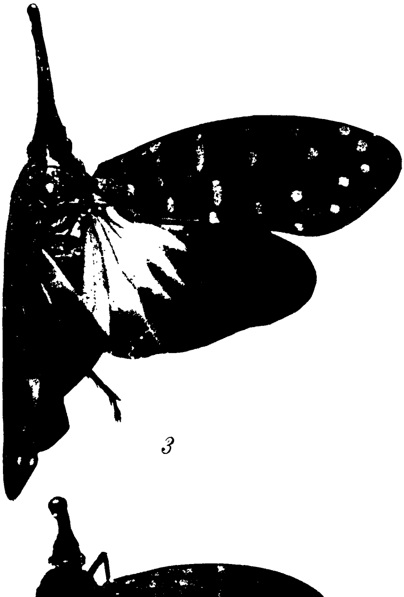

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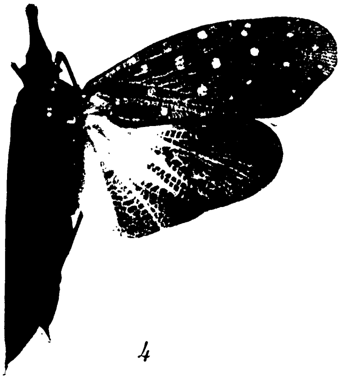

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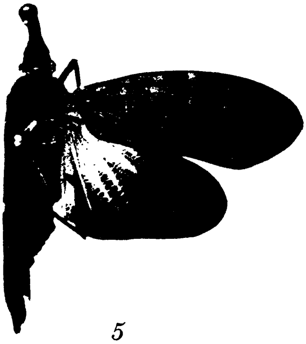

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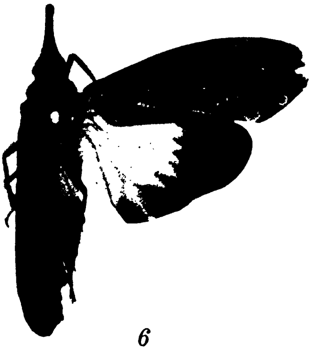

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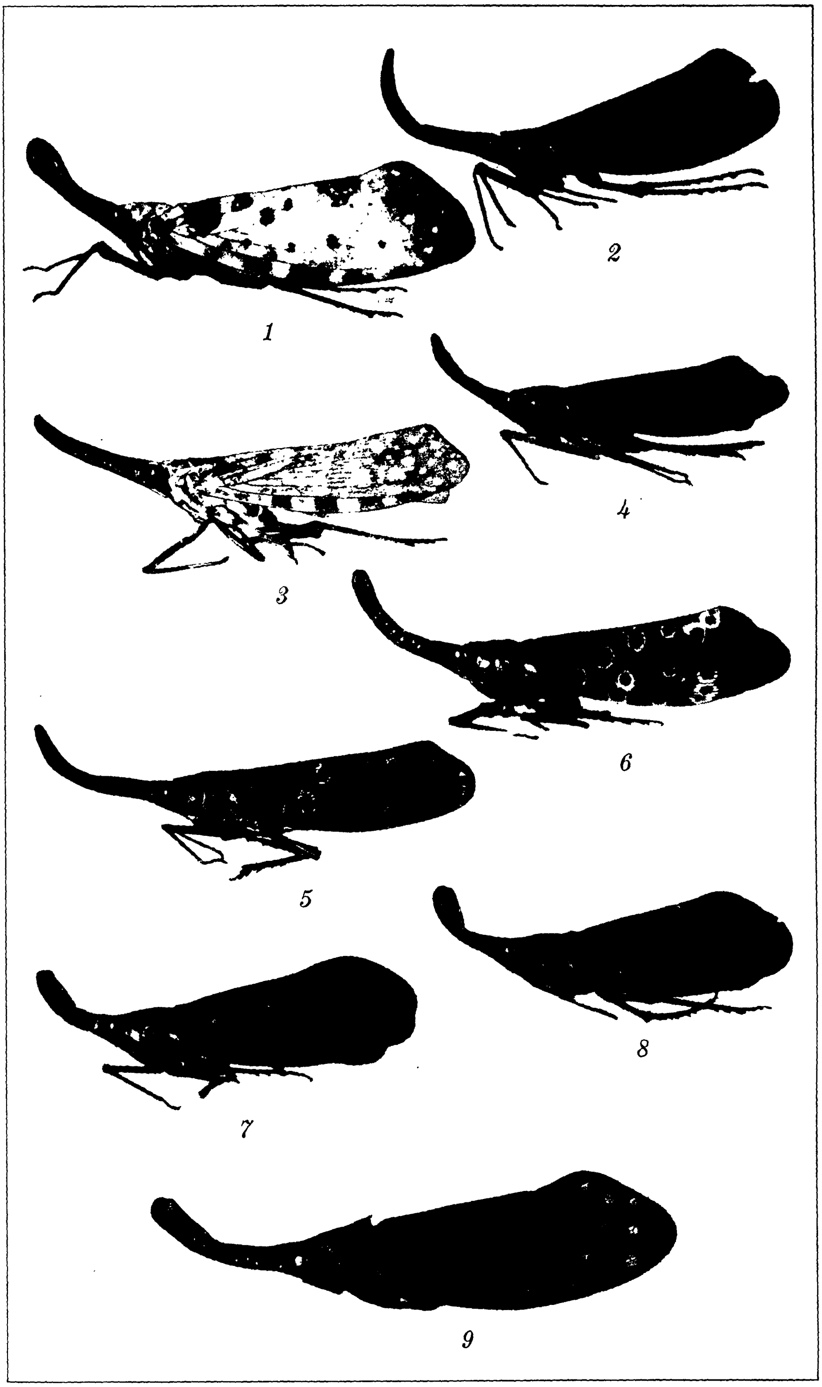

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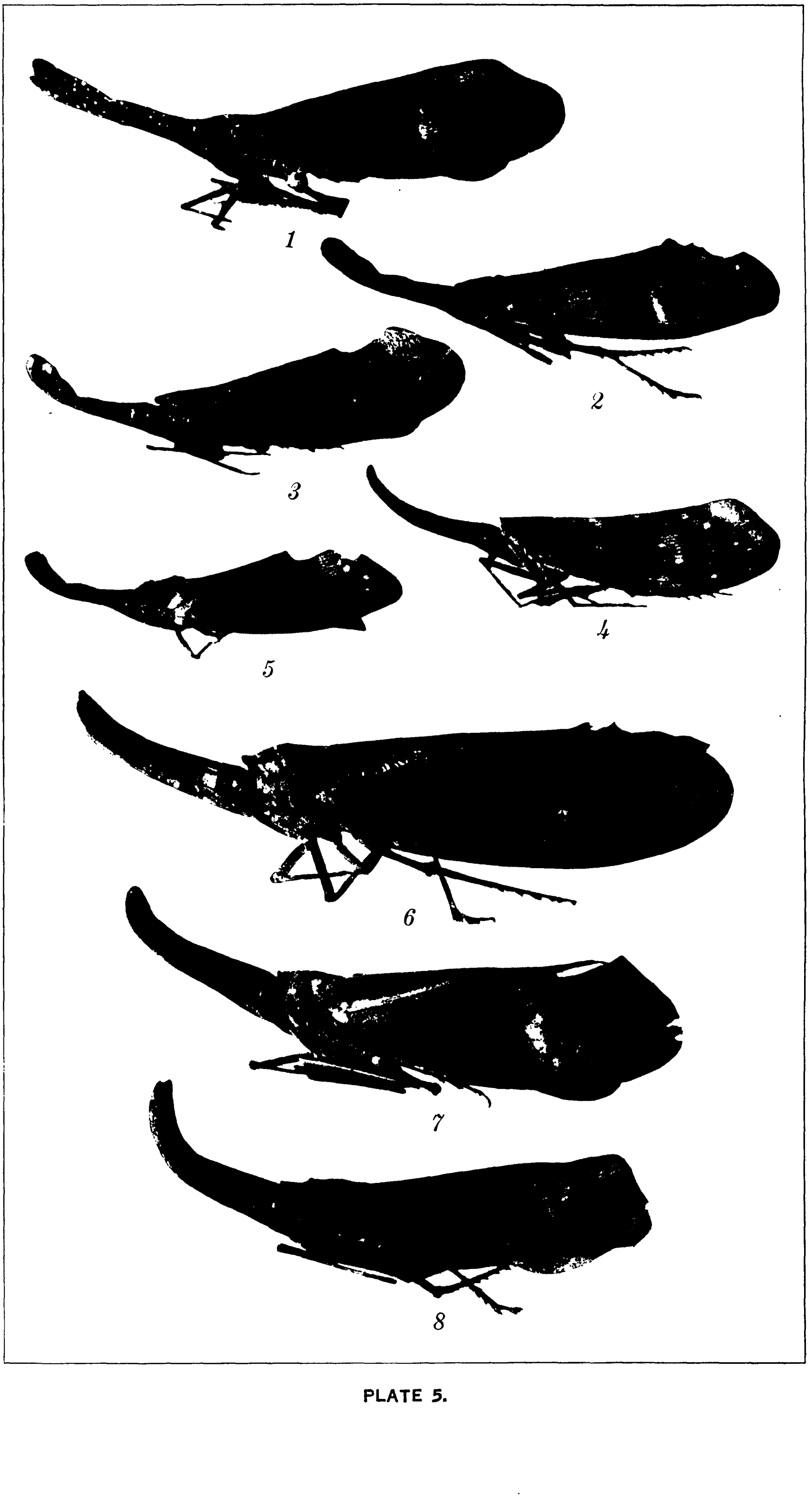

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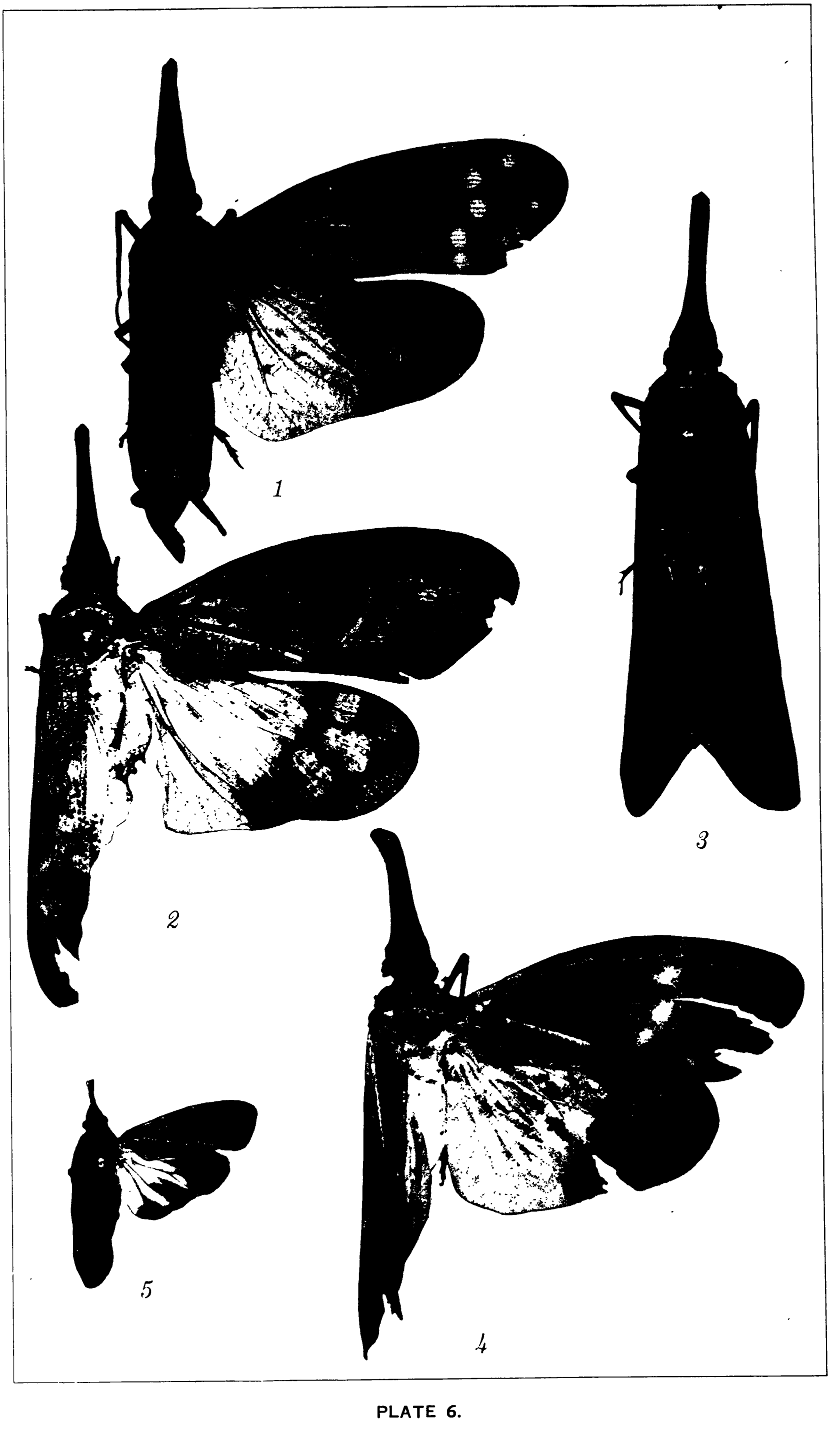

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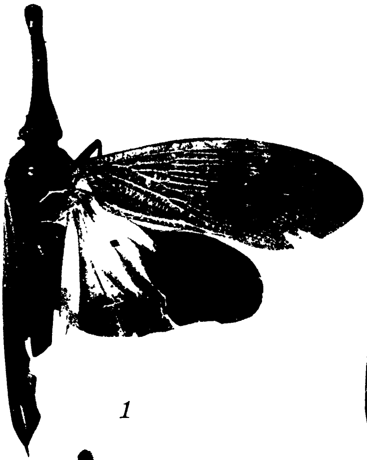
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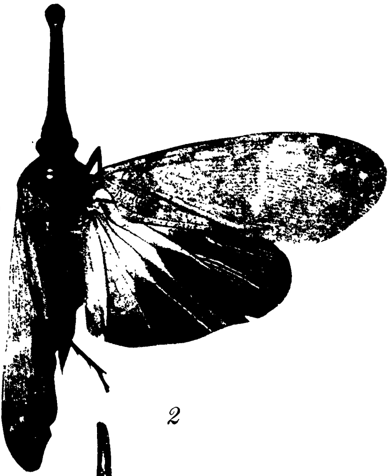
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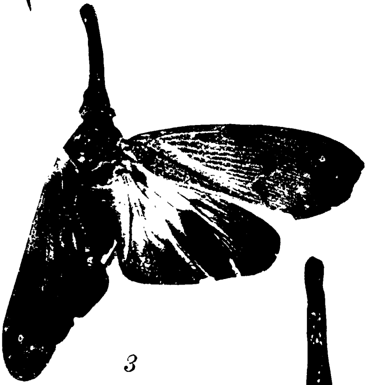
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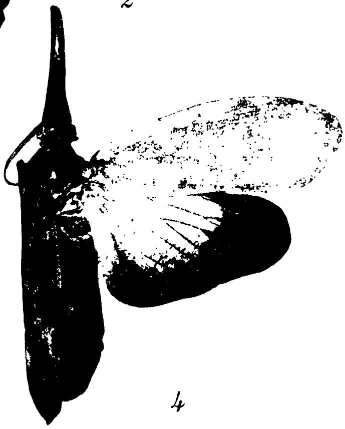
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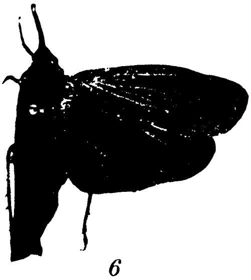
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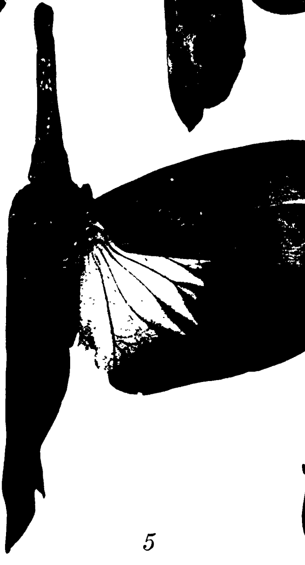
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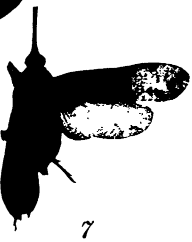
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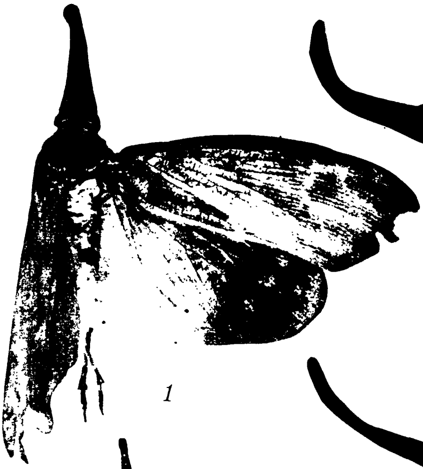

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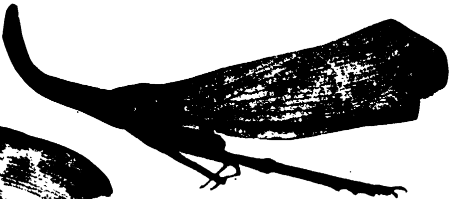

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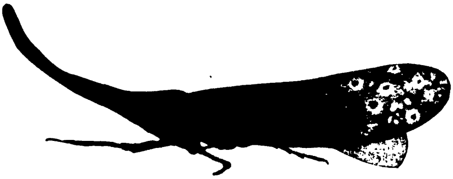

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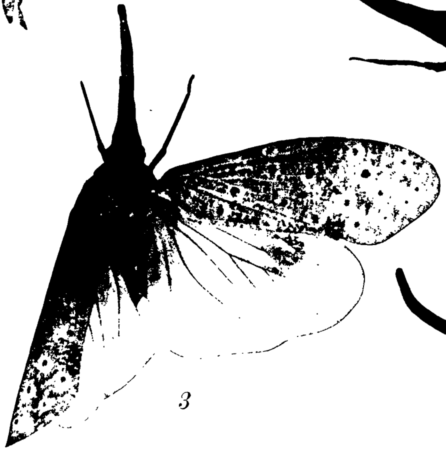

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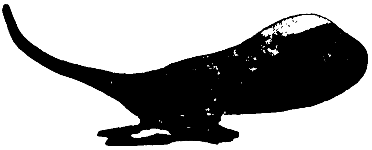

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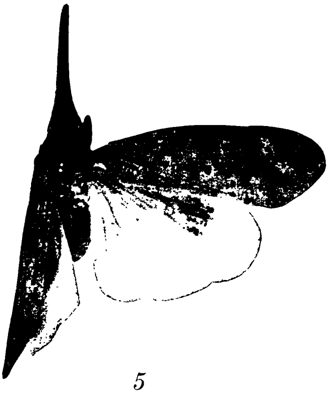

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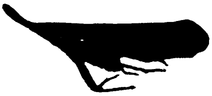

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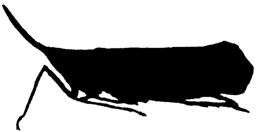

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PLATE 8.

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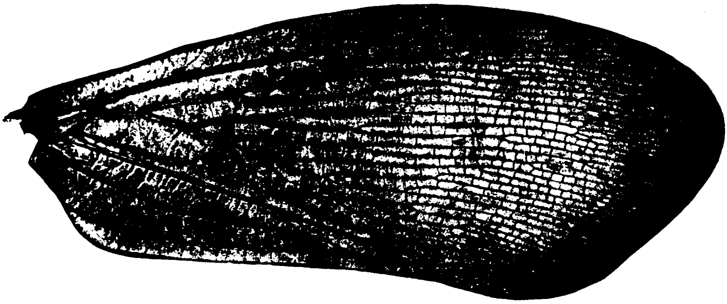

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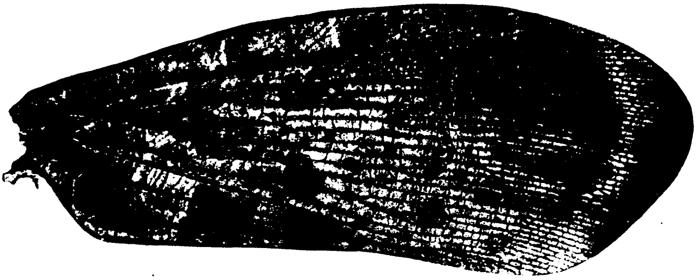

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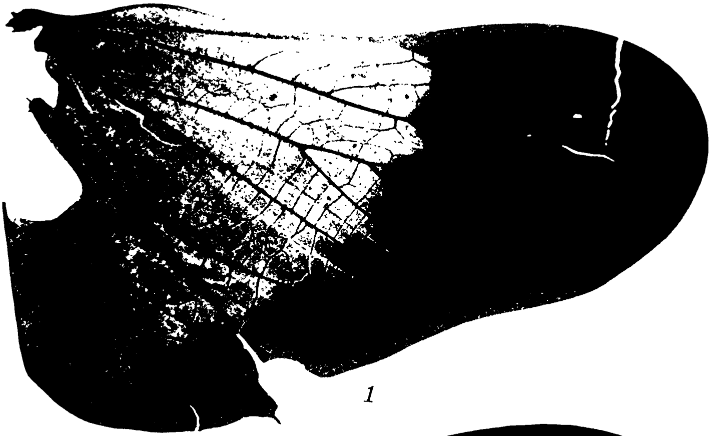

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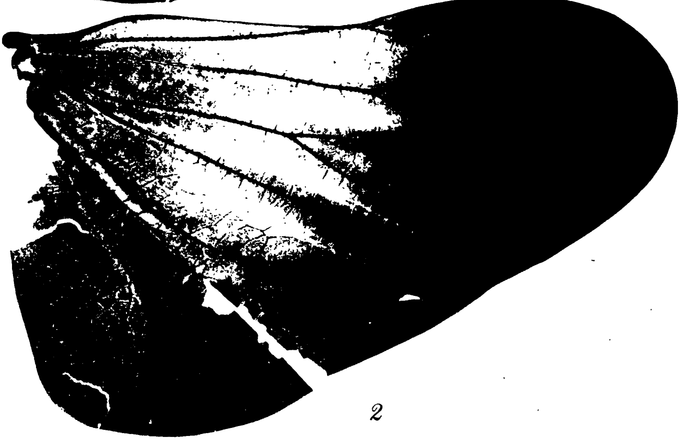

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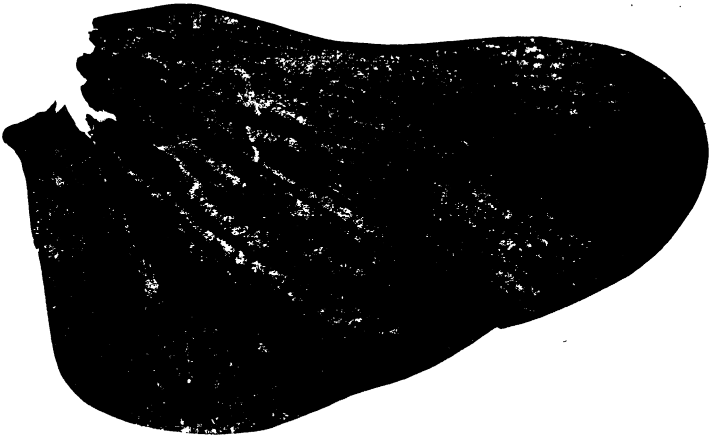

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PLATE 10.

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A NEW SPECIES OF OLIARUS FROM CHINA (FULGOROIDEA, HOMOPTERA)

By F. Muir

Of the Hawaiian Sugar Planters' Experiment Station, Honolulu

ONE TEXT FIGURE

Oliarus tsoui sp. nov.

Male.—Length, 3 millimeters; tegmen, 4.3. Length of vertex 1.6 times width at base, apex slightly rounded, base angularly emarginate; transverse carina subangular, arising about one-third from apex, not touching apical transverse carina; an incomplete median carina partly divides the fossette into two subquadrate areolets, a longitudinal median carina on basal third of vertex. Frons normal, median carina distinct, forked near base, not excavate; clypeal suture obscure; median ocellus distinct. Sc + R fork, Cu fork, and claval fork all about level; two apical Scs, two apical Rs, and five apical Ms. The spines on second and third hind tarsi numerous (twelve to fifteen) and not apical, the apex bearing a row of a similar number of flat, light-colored teeth with rounded apices; three spines on basal half of hind tibia, the basal one smallest.

Head dark brown, carinæ light brown; pronotum light brown or yellow, dark brown in lateral areas; mesonotum dark brown, hind margin narrowly light; tegulæ light; abdomen dark brown, pleura and hind margins light; coxæ dark brown, front and middle legs light with longitudinal dark marks, hind femora dark brown, tibiæ light with longitudinal dark marks. Tegmina on basal two-thirds light, apical third dark fuscous, veins same color as membrane, granules very small and obscure. Wings hyaline, apical portion fuscous, veins same color as membrane.

The left lateral margin of pygofer produced into a small process with round apex, medioventral process acute. Anal segment large, expanded laterally, anus at apex. Genital styles in full view with the apex curved, inner margin nearly straight, outer margin sinuate. Ædeagus complex, periandrium large, produced into a long and curved process, flat, broadest at base, gradually narrowing to acute apex; penis large, produced into a strong spine at apex, with two small spines rising from base.

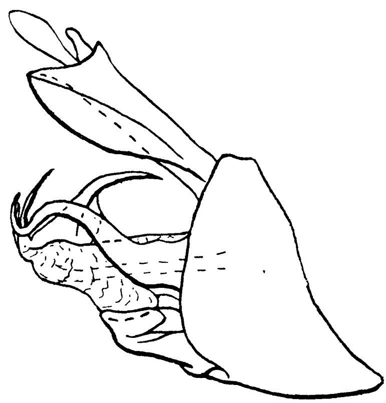

FIG. 1. *Oliarus tsoui* sp. nov., pygofer, lateral view.

Female.—Length, 5.5 millimeters; tegmen, 4. In general build similar to male. Pygofer much broader than long; ovipositor not as long as pygofer; anal segment about half the length of pygofer, straight parallel sided, anus at apex.

Color similar to that of male but much lighter; light brown or yellowish where the male is dark. Tegmina light yellowish, apical portion much lighter than male; wings similar to male.

Described from three males and three females from Nanking, China, taken on rice (*T. L. Tsou*).

Type in the Hawaiian Sugar Planters' Experiment Station, Honolulu, No. 1210. The spines on the hind tarsi are similar to those found in *O. felis,* the type of Kirkaldy's subgenus *Nesopompe.*

ILLUSTRATION

TEXT FIGURE

FIG. 1. *Oliarus tsoui* sp. nov., pygofer, lateral view.

NEW OR LITTLE-KNOWN TIPULIDÆ FROM THE PHILIPPINES (DIPTERA), PART III

By CHARLES P. ALEXANDER

Of Amherst, Massachussetts[1]

ONE PLATE

The present instalment is based primarily upon some interesting crane-fly material taken in Samar by Mr. Richard C. McGregor. A few additional specimens are from the vicinity of Manila. The series of specimens labeled "Loquilocon" were collected 11 kilometers east of Wright, Samar, near the settlement called Loquilocon. I am greatly indebted to Mr. McGregor for his kindness in collecting and submitting these specimens. The types are preserved in my collection.

LIMONIINÆ

Geranomyia cornigera Alexander. Plate 1, figs. 1, 7, and 8.

Geranomyia cornigera ALEXANDER, Insec. Inscit. Menst. 1 (1913) 137–139.

This remarkable crane fly was described from a small series of specimens taken October 22–23, 1912, at Pettit Barracks. Mr. McGregor's material includes two males that were taken at Manila, May 7, 1924. The peculiar characters of a fleshy tubercle, *tu,* on the vertex and a small median tubercle on the cephalic margin of the mesonotal prescutum are shown in fig. 7.

The venation and wing pattern are shown in fig. 1. These specimens are better preserved than the type series and show that the vein Sc_2 is present but faint, placed a short distance before the origin of Rs, near the center of a dark blotch. Moreover, there is a similar weak supernumerary cross vein in the dark subcostal blotch at middistance between arculus and the origin of Rs.

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[1] Contribution from the Department of Entomology, Massachusetts Agricultural College.

The structure of the male hypopygium (fig. 8) had not been discussed in the earlier papers. Ninth tergite, *t*, with the caudal margin evenly rounded, before the margin with a group of about seven large setæ on either side of the median line. Basistyle, *b*, relatively small, with the usual mesal lobe very large. Ventral dististyle, *v*, large and fleshy, covered with abundant dense setulæ and much fewer long powerful setæ; rostriform appendage slender, pendant, pale yellow, terminating in several setæ; two spines on style at base of rostrum, the smaller one at base about one-half the length of second which is placed somewhat more basad. Dorsal dististyle, *d*, moderately curved, the extreme tip narrowed and rather angularly bent. Gonapophyses, *g*, with the mesal apical angle slender, directed caudad, the tip subacute and directed slightly laterad.

Limonia trigonia samarensis subsp. nov.

Male.—Length, 9 millimeters; wing, 11.5. Agreeing with typical *trigonia* (Edwards)[2] of western Sumatra, differing in the following respects:

Size larger, as shown by the measurements. Mesonotal prescutum shiny dark chestnut brown, the usual interspaces narrowly blackish, the lateral margins of the sclerite broadly dark brown; scutal lobes dark brown, the median area conspicuously paler; scutellum dark; postnotal mediotergite dark brown, with a conspicuous paler median area. Pleura conspicuously yellowish with two broad and conspicuous dark brown longitudinal stripes, the more dorsal passing beneath the wing root and surrounding the base of the halteres. The ventral stripe includes the ventral portions of the sternopleurite. Halteres elongate, dark brown, the base and apex of the stem conspicuously ocherous, the knobs blackish. Wings with the dark costal pattern less extensive, the pale interspaces being more than one-half the width of the dark area immediately distad of it. Abdomen with the broad bases of at least the basal four sternites conspicuously whitish.

SAMAR, Loquilocon, July 3, 1924 (*McGregor*).

Orimargula philippina Alexander. Plate 1, fig. 2.

Orimargula philippina ALEXANDER, Insec. Inscit. Menst. 5 (1917) 6–7.

The unique type of this species was a male from Manila. Mr. McGregor collected a female at Loquilocon, Samar, June 22, 1924, that is in a much better state of preservation than the type and is described herewith as allotypical. The indicated differences between the two sexes are probably due in large part to the relative condition of the two types.

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[2] Journ. Fed. Malay States Mus. 8 (1919) 15–16.

Female.—Length, about 2.5 millimeters: wing, 3.6. Rostrum and head dark brown. Cervical sclerites elongate, as in *Toxorhina* and allied genera. Mesonotum dark brown, the scutellum conspicuously pale. Pleura dark brown, with a pale transverse stripe extending from the wing root ventrad across the cephalic margin of the pteropleurite, hypoepimeron, and meron, onto the posterior coxæ which are thus conspicuously paler than the others. Halteres pale brown, the base of the stem conspicuously paler. Legs rather dark brown. Wings as in the type; venation as in fig. 2.

SAMAR, Loquilocon, June 22, 1924 (*McGregor*); allotype, female.

Eriocera lativentris Bezzi.

Eriocera lativentris BEZZI, Philip. Journ. Sci. § D 12 (1917) 113.

SAMAR, Loquilocon, June 21, 1924 (*McGregor*), a male.

Two females that are referred to this species were taken at the same station on May 30, 1924. However, these female specimens do not exhibit any dilation of the abdominal segments as does the male and may not be correctly associated.

Eriocera spatulata sp. nov. Plate 1, fig. 5.

Abdomen with the basal half slender, the segments cylindrical, the apical segments dilated into a conspicuous blackened spatula; general coloration gray; legs black; wings strongly suffused with blackish; a discal blotch and bases of the anal cells dirty whitish.

Male.—Length, 13 to 14 millimeters; wing, 11.2 to 12.5. Rostrum and palpi black, the former dusted with gray. Antennæ relatively short; scapal segments dark colored, dusted with gray; flagellum pale yellowish brown, the terminal segments darker; flagellar segments decreasing in length and diameter to the end. Head light gray, with a small vertical tubercle.

Pronotum black, pruinose. Mesonotal prescutum gray, the interspaces with conspicuous erect black setæ; three smooth, darker gray stripes, the lateral ones narrowly margined with blackish, the median stripe broadly divided medially by a blackish line; remainder of mesonotum dark gray, pruinose. Pleura black, sparsely pruinose. Halteres short, stout, black. Legs with the coxæ and trochanters black, the fore coxæ a trifle paler; remainder of legs black, the fore femora a very little paler. Wings (fig. 5) with a strong blackish tinge, the base and costal margin darker; a dirty white band crosses cells 1st R_1, R, and M immediately before the cord; bases of cells 1st A and 2d A extensively dirty white; veins black. Venation: Sc_1 ending opposite midlength of the basal section of R_2, Sc_2 before the fork of R_{2+3}; Rs elongate, feebly angulated at origin, a little longer than R; r more than its length beyond the fork of R_{2+3}; basal section of R_{4+5} about equal to R_{2+3}; cell M_1 very small, asymmetrical, M_2 being in alignment with M_{1+2}; cell 1st M_2 relatively small, the proximal end weakly angulated shortly before r-m; m-cu varying in position from before to beyond midlength of cell 1st M_2, about one-half longer than the distal section of Cu_1; vein 2d A long, sinuous.

Abdomen unique in structure, so far as the family Tipulidæ is concerned, in that the terminal segments are dilated into a spatula, producing an appearance that is suggestive of certain Conopidæ and aculeate Hymenoptera; basal four segments reddish brown, blackened laterally, more narrowly darkened caudally, very slender; the apex of the fourth segment begins to widen out and is blackened; segments 5 to 7 dilated, black; segments 8 and 9 gradually narrowed and shortened, black.

In one paratype, in both wings vein M_1 is deflected cephalad and unites with the tip of vein R_{4+5}, closing cell R_5.

SAMAR, Loquilocon, June 28, 1924 (*McGregor*); four males.

Elephantomyia (Elephantomyodes) samarensis sp. nov. Plate 1, fig. 4.

General coloration of the thorax orange-yellow; legs black, the tarsi extensively light yellow; wings subhyaline, cell Sc and the stigma infuscated; cell 2d A very narrow; abdomen black, the base of each segment narrowly yellowish.

Female.—Length, excluding rostrum, 10.5 millimeters; wing, 7.4; rostrum alone, about 8. Rostrum long and slender, brownish black. Antennæ brownish black, the scapal segments a trifle paler; flagellar segments oval; basal flagellar segment about equal in length to the following two taken together, the more distal segments becoming fusiform, all but the basal flagellar segment with long delicate verticils. Head dark brownish gray; vertex between the eyes very narrow.

Pronotum yellowish brown. Mesonotum orange or orange-yellow, the scutellum and postnotal mediotergite more infuscated. Pleura testaceous yellow to orange. Halteres long and slender, black. Legs with the coxæ and trochanters concolorous with the pleura; femora and tibiæ black, the extreme bases of the former narrowly paler; basitarsi black, the tips abruptly light yellow, this including a little more than one-fourth the segment; segments 2 and 3 concolorous; segments 4 and 5 dark brown. Wings subhyaline, cell Sc and the stigmal region, which includes cells Sc_1 and 2d R_1, dark brown; veins dark brown. Venation (fig. 4): Sc_1 ending shortly before the fork of Rs, Sc_2 at its tip; Rs very strongly arcuated to weakly angulated at origin, cell 1st R_1 being very wide; cell 2d R_1 abruptly reduced to a linear strip occupied by the stigma, gently widened outwardly; R_{2+3} perpendicular at origin, in alignment with r-m, beyond the base bent at a right angle, with what seems to represent r as a spur at the bend, this delimiting the proximal end of the stigma; R_{4+5} in direct alignment with Rs, the veins at the end of the sector thus forming a cross; cell 1st M_2 rectangular; m-cu a little more than one-half its length beyond the fork of M; distal section of Cu_1 shorter than m-cu; distance on margin between Cu_1 and 1st A about equal to the distal section of Cu_1; cell 2d A reduced to a narrow linear strip.

Abdomen black, the basal third or less of each segment conspicuously bright yellow. Ovipositor with the long straight valves rusty horn colored.

SAMAR, Loquilocon, July 2, 1924 (*McGregor*); a female.

The subgenus *Elephantomyodes*[3] was erected by me for the Formosan *E. major* Alexander. The group includes a number of Oriental and Australasian species. The present fly is distinguished from the other known species by the very narrow cell 2d A, in conjunction with the cruciform arrangement of the veins at the fork of the sector.

Styringomyia mcgregori sp. nov. Plate 1, figs. 3 and 9.

Mesonotal prescutum ashy gray with linear black interspaces posteriorly; legs uniformly dark brown; wings yellowish subhyaline, immaculate; vein 2d A elongate, not incurved to the anal margin.

Male.—Length, 6 to 6.5 millimeters; wing, 4 to 4.8.

Female.—Length, about 4 millimeters; wing, about 4.

Rostrum and palpi brown. Antennæ brown. Head brown, the orbits and anterior part of the front broadly and conspicuously whitish; genæ and postgenæ darkened.

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[3] Ann. Ent. Soc. Am. 16 (1923) 64.

Pronotum light yellow, indistinctly darkened medially. Mesonotal prescutum light ashy gray, narrowly lined posteriorly with darker, these lines representing the usual interspaces; lateral margins of prescutum narrowly but conspicuously more yellowish; scutal lobes darkened; scutellum conspicuously yellow medially, the sides and the parascutella darker; postnotal mediotergite gray with a narrow yellowish median line. Pleura dark, the base of the wing more yellowish. Halteres pale brown, the knobs somewhat darker. Legs dark brown, without markings. Wings yellowish subhyaline, immaculate; veins a trifle darker colored. Venation (fig. 3): Vein 2d A elongate, running straight to the margin, ending some distance beyond the origin of Rs.

Abdomen pale yellowish brown, the lateral margins narrowly darker colored; sternites more yellowish; hypopygium brownish testaceous. Male hypopygium (fig. 9) with the basistyles, *b,* produced caudad into a long fingerlike lobe which bears several elongate setæ, the two that are more nearly apical in position somewhat stouter, the subterminal setæ on mesal face long and slender, curved. Dististyles, *d,* complex, the mesal lobe very extensive, densely set with powerful, recurved bristles, the style terminating in a powerful, blackened, gently curved spine. What seems to be an interbasal process, *i,* appears as a gently curved, cylindrical, blackened rod.

LUZON, Manila, October 1, 1924 (*McGregor*); a male. A pair in copula at light on October 2, 1924.

Styringomyia mcgregori is very distinct from all described species in the cinereous mesonotum, the uniformly dark brown legs, and the subhyaline, unmarked wings, with vein 2d A long and running straight back to the anal margin. The only other known species having the latter character are *S. venusta* Loew (fossil in copal) and *S. bipunctata* Edwards (Queensland). The present species is unusually primitive in the scarcely modified apices of the basistyles of the male hypopygium. This very interesting fly is named in honor of the collector, Mr. Richard C. McGregor, to whom I am indebted for many favors in the past.

TIPULINÆ

Pselliophora præfica fenestrella subsp. nov.

Female.—Length, about 20 millimeters; wing, 20.5. Agreeing with typical *præfica* Bezzi in its general black coloration, differing in the following respects:

Branches of the flagellar segments relatively elongate, stout. Wings dark brown, all of the cells of the wing with the exception of Sc and 2d R_1 with conspicuous pale gray centers, restricting the ground color to uniform conspicuous seams to all the veins and as a margin of equal width that completely encircles the wing.

SAMAR, Loquilocon, June 18, 1924 (*McGregor*); a female.

Pselliophora tigriventris sp. nov. Plate 1, fig. 6.

Allied to *P. gaudens* (Walker); general coloration orange; head scarcely variegated with darker; mesonotal prescutum with three brownish black stripes; halteres orange with brownish black knobs; legs black, the femoral bases conspicuously orange, broadest on the posterior legs; all tibiæ with white subbasal rings; wings black, the base broadly and conspicuously orange-yellow; a triangular paler yellow discal blotch; abdomen orange, the segments conspicuously cross-banded with black.

Female.—Length, about 20 millimeters; wing, 17.5. Frontal prolongation of head yellow, blackened laterally; palpi dark brown, the third segment more yellowish. Antennæ with the scapal segments yellow; basal segment of flagellum elongate, obscure yellow, the ventral face infuscated; the terminal ten flagellar segments dark brown, gradually becoming shorter and more crowded, the terminal segment very small. Head orange-yellow, the occiput darkened behind.

Pronotum orange, the sides narrowly blackened. Mesonotal prescutum orange, with three conspicuous brownish black stripes that are contiguous near the suture, which is conspicuously blackened medially; scutum orange, each lobe with two brownish black spots on anterior half; scutellum orange, the parascutella black; postnotal mediotergite orange, narrowly margined anteriorly and posteriorly with brownish black, the latter marking extending onto the postnotal pleurotergite and completely surrounding the base of the halteres. Pleura orange-yellow, conspicuously variegated with brownish black markings, these including spots on the propleura, dorsopleural membrane, a spot on pteropleurite immediately ventrad of the wing root, and some smaller ventral markings. Halteres conspicuously orange, the knobs brownish black. Legs with the fore and middle coxæ extensively infuscated, the posterior coxæ largely obscure orange; trochanters obscure orange; fore and middle femora black, the bases conspicuously orange, this narrowest on the fore femora, a little more extensive on the middle femora where about the basal third is included; posterior femora orange with less than the apical third blackened; tibiæ black, each with a conspicuous white subbasal ring, approximately equal in extent on all the legs or that of the fore tibia a trifle wider; tarsi black. Wings (fig. 6) blackened, the base broadly and conspicuously bright orange-yellow; a roughly triangular discal area of a paler shade of yellow, this including portions of cells 1st R_1, R, M, 1st M_2, and the extreme proximal ends of cells R_3, M_3, and M_4; pale brownish white washes in cells Cu and 1st A on either side of vein 1st A; veins dark brown, more orange-yellow in the flavous basal and discal areas. Venation: Sc_1 preserved; cell M_1 narrowly sessile; m-cu immediately beyond the fork of M_{3+4}.

Abdomen orange, each tergite with a broad, conspicuous, black ring across the middle, leaving the base and apex broadly of the ground color; on tergite 7, the pale apex decreases in extent, on tergites 8 and 9 being replaced by black. Basal shields of ovipositor conspicuously blackened. Ovipositor straight, brownish black, the tips of the valves narrowly brightened.

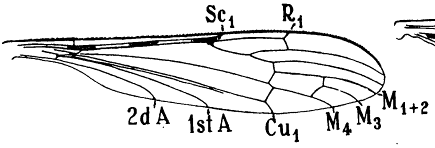
SAMAR, Loquilocon, June 13, 1924 (*McGregor*); a female.

ILLUSTRATION

[Legend: *A*, anal veins; *b*, basistyle; *Cu*, cubitus; ***d***, dististyle; *g*, gonapophyse; *i*, interbase; ***M***, media: *m-cu*. medial-cubital cross vein; *R*, radius; *Sc*, subcosta; *t*, tergite; ***tu***, tubercle on vertex of head; *v*, ventral dististyle. Venational terminology used: Comstock-Needham-Tillyard. Hypopygial terminology used: Crampton.]

PLATE 1

FIG. 1. *Geranomyia cornigera* Alexander, wing.
2. *Orimargula philippina* Alexander, wing.
3. *Styringomyia mcgregori* sp. nov., wing.
4. *Elephantomyia* (*Elephantomyodes*) *samarensis* sp. nov., wing.
5. *Eriocera spatulata* sp. nov., wing.
6. *Pselliophora tigriventris* sp. nov., wing.
7. *Geranomyia cornigera* Alexander; head and thorax, lateral aspect.
8. *Geranomyia cornigera* Alexander, male hypopygium.
9. *Styringomyia mcgregori* sp. nov., male hypopygium.



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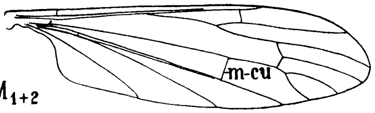

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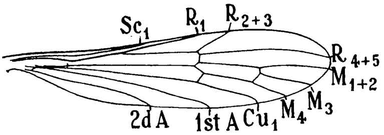

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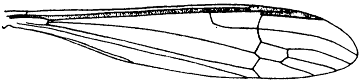

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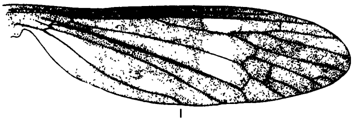

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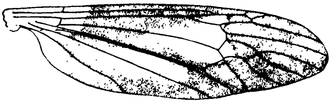

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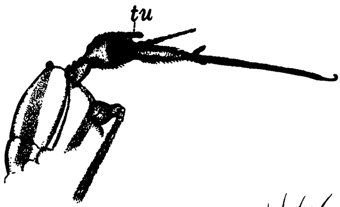

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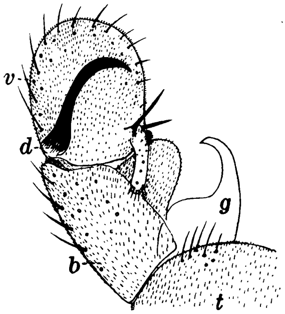

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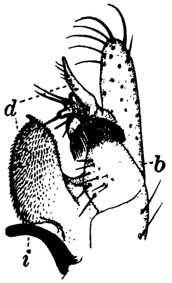

9

PLATE 1.

UNIV. OF MICH.

DIE GATTUNG PRIOPTERA HOPE (COLEOPTERA, CASSIDIDÆ)

Von FRANZ SPAETH
Vienna, Austria

ZWEI TAFELN

Genus **PRIOPTERA** Hope

Scheitel vor dem Halsschild vortretend, dahar von oben sichtbar; Kopf senkrecht gestellt; die Augen treten nicht aus ihm heraus. Fühler fadenförmig, die Glieder vom vierten oder sechsten angefangen dicht aneinander gereiht, der Anfang des folgenden Gliedes immer von der gleichen Dicke wie das Ende des vorhergehenden, daher zwischen den Gliedern kein Einschnitt, ihre Abgrenzung oft nur schwer erkennbar; die äusseren Glieder von elliptischem Durchschnitt, daher bei Daraufsicht schmäler als bei seitlicher Ansicht. Das erste Glied mässig gross, das zweite fast kugelig, das dritte wenig länger, das vierte stets, oft nur wenig, zuweilen aber viel länger als das dritte; die äusseren Glieder werden meist allmählig dicker, so dass das zehnte oder (besonders beim Weibchen) das elfte am dicksten ist; letzteres am Ende minder schräg, beim Weibchen mehr als beim Männchen abgestutzt, beim Weibchen dicker; beim Männchen ist das letzte Glied stets, meist nur wenig, aber in zwei Untergruppen (*westermanni* und *chinensis*) bedeutend länger als beim Weibchen; mit abstehenden Haaren an der Spitze besetzt.

Halsschild quer trapezförmig, doppelt so breit als lang, nach hinten nur schwach erweitert, am Vorderrande tief ausgerandet, mit minder breit verrundeten Vorderecken; die Seiten vorne stark gerundet, hinten wenig oder gerade, mit ganz oder nahezu rechtwinkligen Hinterecken; die Scheibe vorne schmal gerandet, an den Seiten durch eine eingegrabene Längslinie, die meist bis zum Hinterrande reicht, in der *octopunctata*-Gruppe aber durch eine Querwölbung unterbrochen wird, breit abgesetzt, vor dem Basallappen oft mit einem Grübchen; der Hinterrand jederseits zweimal tief gebuchtet. Die Flügeldecken an der Basis krenuliert, wie die Halsschildbasis gebuchtet, hier immer von der gleichen Breite wie diese, dahinter erweitert, erst hinter der Mitte am breitesten, an der Spitze meist verrundet, selten beim Weibchen schwach zugespitzt. Die Scheibe gehöckert oder gleichmässig gewölbt, fast immer verworren, selten in unregelmässigen Streifen (*prognata*) punktiert, oft aber mit Andeutung von schwachen Rippen, immer aussen durch einen regelmässigen Randstreif von dem Seitendache getrennt, welches breit, ziemlich flach abgesetzt und glatt ist.

Klauen divergierend, glatt, ohne Zahn. Prosternum zwischen den Vorderhüften mässig schmal, der Fortsatz stark erweitert, am Ende kurz lanzettförmig zugespitzt, flach oder eingedrückt.

Die *Prioptera*-Arten sind von den Sunda-Inseln über das Festland von Hinterindien bis zum Himalaya, über Indo- und Süd-China bis Shantung, über die Philippinen und Molukken bis Aru verbreitet. Von Ceylon, Vorder-Indien, Japan, und Neu-Guinea wurden bisher noch keine Vertreter der Gattung bekannt. Die örtliche Verbreitung der einzelnen Arten ist mit Ausnahme von *decempustulata* und *decemmaculata,* die sich in verschiedenen Unterformen von Sumatra über Malacca bis in das indische Bergland verbreiten, meist sehr, oft nur auf eine Insel beschränkt.

Von den im Catalogus Coleopterorum pars 62 (Cassidinæ) von mir aufgeführten 40 Arten fallen 11 teils als Synonyme, teils als Unterformen weg; dagegen treten ausser der dort nicht erwähnten *palawanica* (Weise, 1913) nunmehr 23 neue Arten hinzu, so dass jetzt die Gesammtzahl der bekannten Arten 52 beträgt. Hievon entfallen auf die Sunda-Inseln und Malacca 16, auf Assam und die südlichen Vorgebirge des Himalaya 5, auf Indochina und Siam 7, auf China 4, auf die Philippinen 12, auf Celebes 3, auf die Molukken und Aru 4, und auf die Andamanen 1 Art.

Von den verwandten Gattungen ist *Prioptera* unterschieden durch den breit abgesetzten Seitenrand des Halsschildes und das breitere Seitendach der Flügeldecken. *Calopepla* und *Epistictia* werden von ihr überdies durch die minder oblonge Körperform, die viel schwächere Ausrandung des anders gestalteten Halsschildes, *Megapyga* und *Calopepla* durch die Punktstreifen der Flügeldecken unterschieden; endlich sind bei allen diesen Gattungen die Fühler wesentlich kürzer und kräftiger.

Genotypus der Gattung ist *P. octopunctata* Fabricius. Die Entwicklungsstände sind bisher nur von *P. schultzei* und *sinuata* beobachtet worden; ferner liegt mir die Puppe von *sarawacensis* vor.

Ueber die, besonders in den Gruppen von *sexmaculata* und *chinensis* sehr auffällige Gestalt des Penis dürften die von Herrn Professor Otto Scheerpeltz verfassten Zeichnungen auf den angeschlossenen zwei Tafeln besseren Aufschluss geben als meine Beschreibungen. Sämtliche Formen sind von der Seite und von vorne dargestellt.

Uebersichts-Tabelle der Arten von Prioptera Hope.

1. Die Rinne, welche die Scheibe des Halsschildes von den Seiten trennt, ist durch eine gegen die Hinterecken verlaufende Wölbung unterbrochen ..... 2.
   Diese Rinne läuft ohne Unterbrechung bis an den Hinterrand des Halsschildes ..... 4.
2. Höcker hoch und spitz; die Profillinie hinter ihm tief ausgerandet, konkav ..... **P. decempustulata** Boheman.
   P. nigricollis Weise.
   Höcker niedrig und stumpf; die Profillinie hinten gerade oder kaum ausgerandet ..... 3.
3. Halsschild ohne Flecken ..... **P. vicina** sp. nov.
   Halsschild mit zwei dunklen Flecken ..... **P. sarawacensis** Spaeth.
   P. octopunctata Fabricius.
4. Flügeldecken gehöckert, im Basaldreieck eingedrückt, Profillinie gebrochen ..... 5.
   Flügeldecken nicht gehöckert, im Basaldreieck nicht oder unbedeutend eingedrückt. Die Profillinie verläuft in einem Bogen ..... 24.
5. Flügeldecken mit braunroter, tief runzelig punktierter Scheibe, der Innenrand der Epipleuren und der Saum des Hinterleibes rötlich, der übrige Körper einschliesslich der ganzen Fühler und Beine schwarz ..... **P. schultzei** Weise.
   Flügeldecken und Halsschild gelb oder rötlich, ohne oder mit Flecken. Fühler mindestens an der Basis hell ..... 6.
6. Profillinie hinter dem Höcker ausgerandet, konkav ..... 7.
   Profillinie hinter dem Höcker gerade ..... 10.
7. Die Ausrandung der Profillinie ist tief, der Höcker hoch ..... 8.
   Die Ausrandung der Profillinie ist seicht, der Höcker stumpf ..... 9.
8. Höchstens das letzte Endglied der Fühler teilweise dunkel.
   P. octomaculata Boheman.
   P. gibbosa Baly.
   Die Fühler mit Ausnahme der Basis schwarz ..... **P. atricornis** Spaeth.
   P. gibbifera sp. nov.
9. Seitendach hinten schwarz gezeichnet. Flügeldecken mit vier schwarzen Flecken ..... **P. morigera** sp. nov.
   Seitendach hinten ungefleckt. Flügeldecken mit zwei dunklen Binden.
   P. sumatrana Weise.
10. Höchstens das letzte Fühlerglied ganz oder teilweise schwarz ..... 11.
    Die zwei letzten Fühlerglieder schwarz, nur ausnahmsweise die Basis des zehnten Gliedes noch hell ..... 18.

11. Flügeldecken mit einer gemeinsamen Spitzenmakel .... 12.
Flügeldecken ohne Spitzenmakel .... 13.

12. Halsschild mit zwei schwarzen Flecken, Scheitel schwarz.
P. decemstillata Boheman.
Halsschild ungefleckt, Scheitel gelb .... **P. andrewesi** Weise.

13. Halsschild mit zwei dunklen Flecken .... 14.
Halsschild ohne dunkle Flecken .... 15.

14. Die Halsschildflecken stehen nebeneinander an der Basis; Scheibe der Flügeldecken grob runzelig punktiert, trüb-blutrot, matt.
P. maerkeli Boheman.
Die Halsschildflecken stehen nebeneinander in der Längsmitte. Scheibe der Flügeldecken fein verloschen punktuliert, gelb, glänzend.
P. privigna Boheman.

15. Scheibe der Flügeldecken ohne dunkle Flecken, mit deutlicher Rippenbildung. Umriss nach hinten stark erweitert.
P. bimaculata Thunberg.
Scheibe mit je vier dunklen Flecken, von denen allenfalls einige nur angedeutet sind oder auch fehlen. Rippen fehlen oder kaum angedeutet. Umriss nach hinten höchstens schwach erweitert .... 16.

16. Umriss fast quadratisch. Höcker sehr niedrig und stumpf; das Seitendach fast halb so breit als eine Flügeldecke .... **P. palawanica** Weise.
Umriss eiförmig, nach hinten erweitert; das Seitendach schmäler als eine halbe Flügeldecke .... 17.

17. Die schwarzen Flecken auf den Flügeldecken klein, insbesonders überschreitet die Makel 2 nicht den Umriss des Hauptgrübchens; Flügeldecken deutlich punktiert, lackartig glänzend, Hauptgrübchen sehr tief, Seitendach sehr schmal .... **P. quadriimpressa** Boheman.
Die Flecken sind gross, die Makel 2 reicht über das mässig tiefe Hauptgrübchen. Scheibe verloschen punktiert; Seitendach breiter.
P. puellaris sp. nov.

18. Länge 7 Millimeter. Fühler des Männchens von weniger als der halben Körperlänge, ihr Endglied kaum um die Hälfte länger als das zehnte; Flügeldecken grob und tief, runzelig punktiert.
P. rugosipennis Spaeth.
Länge mindestens 10 Millimeter. Fühler des Männchens von der halben Körperlänge, das Endglied mindestens um die Hälfte länger als das zehnte .... 19.

19. Flügeldecken grob und runzelig, auf dem Abfall kaum feiner punktiert.
P. sexmaculata Boheman.
P. secreta sp. nov.
Flügeldecken fein, auf dem Abfall schwächer punktiert .... 20.

20. Die äussere Rippe in der Basalpartie sehr hoch und glatt, ebenso stark wie die innere; Seitengrübchen dunkel gefleckt.
P. multiplagiata Wagener.
Die äussere Rippe schwächer als die innere; Seitengrübchen nicht gefleckt .... 21.

21. Flügeldecken höher gewölbt, vorn fein punktiert; Seitendach stark konvex .... **P. westermanni** Boheman.
Flügeldecken schwach gewölbt, vorne grob punktiert; Seitendach schwach konvex .... 22.

22. Flügeldecken auf der Scheibe ungefleckt.................... **P. pudica sp. nov.**
    Flügeldecken auch auf der Scheibe gefleckt.................... 23.

23. Scheibe vorne ohne Flecken.................... **P. cerata sp. nov.**
    P. opima sp. nov.
    Scheibe auch vorne mit Flecken.................... **P. encausta sp. nov.**

24. Flügeldecken mit einer gemeinsamen Makel an der Höckerstelle........ 25.
    Flügeldecken ohne diese Makel.................... 26.

25. Nahtspitze schwarz. Länge 10 Millimeter.................... **P. bakeri sp. nov.**
    Nahtspitze hell. Länge 7.5 Millimeter.................... **P. ramigera Boheman.**

26. Flügeldecken mit je einer breiten schwarzen Längsbinde und einem schwarzen Fleck auf dem Seitendach.................... **P. whitei Boheman.**
    Flügeldecken anders oder nicht gezeichnet.................... 27.

27. Flügeldecken verworren punktiert oder nur mit einzelnen, feinen Punktreihen .... 28.
    Flügeldecken mit groben, fast regelmässigen Punktstreifen.
    P. prognata sp. nov.

28. Halsschild mit zwei schwarzen Punktflecken neben einander; vor dem Basallappen ein tiefer Eindruck.................... **P. decemmaculata Boheman.**
    Halsschild ganz gelb oder unbestimmt schwarz gefleckt.................... 29.

29. Flügeldecken grob punktiert, auf dem Abfall nicht feiner als auf dem Rücken .... 30.
    Flügeldecken auf dem Abfall feiner punktiert als auf dem Rücken oder überhaupt fein punktiert.................... 31.

30. Flügeldecken behaart; Halsschild grob gerunzelt.... **P. timorensis sp. nov.**
    Flügeldecken unbehaart; Halsschild glatt.................... **P. scheerpeltzi sp. nov.**

31. Länge über 10 Millimeter.................... 32.
    Länge unter 10 Millimeter.................... 41.

32. Scheibe der Flügeldecken ungefleckt oder mit kleinen Punktflecken.... 33.
    Scheibe der Flügeldecken mit grossen Makeln.................... 38.

33. Flügeldecken gröber punktiert, mit kräftigen oder feinen, nur durch die begleitenden Punkte markierten Rippen; Scheibe der Flügeldecken stets ungefleckt; Fühler des Männchens um die Hälfte länger als die des Weibchens.................... 34.
    Flügeldecken verloschen und fein punktiert, ohne Rippen. Fühler des Männchens nur wenig länger.................... 35.

34. Männchen viel breiter und gerundeter als das Weibchen. Halsschild vor dem Basallappen tief eingedrückt. Rippen hoch. Punktierung der Flügeldecken gröber, Grübchen gross und tief; Seitendach von der halben Breite der Decke. Länge über 15 Millimeter.
    P. chinensis Fabricius.
    Männchen und Weibchen verkehrt-eiförmig, wenig verschieden. Halsschild vor dem Basallappen kaum eingedrückt; Rippen niedrig; Punktierung mässig grob, Grübchen seicht. Länge unter 15 Millimeter. Seitendach schmäler als eine halbe Decke.
    P. bisignata Boheman.
    P. angusta Spaeth.

35. Seitendach an der breitesten Stelle von der halben Breite einer Flügeldecke .... 36.
    Seitendach überall schmäler als die halbe Flügeldecke.................... 37.

36. Hauptgrübchen ohne Fleck.. **P. latissima** Wagener.
Hauptgrübchen dunkel gefleckt.. **P. sospes** sp. nov.

37. Flügeldecken mit vier Flecken........................ **P. octopustulata** Boheman.
Flügeldecken ungefleckt oder höchstens mit einem Punktfleck im Hauptgrübchen.. **P. immaculata** Wagener.
P. subopaca sp. nov.

38. Flügeldecken stark quer gewölbt; die vorderen Flecke fliessen an der Naht stets zusammen.. **P. trux** sp. nov.
Flügeldecken schwach quer gewölbt; die vorderen Flecke fliessen (ausser bei Tieren mit ganz schwarzer Scheibe) nicht zusammen.. 39.

39. Seitenrand hinter den Schultern schwach ausgerandet. Flügeldecken grob, stellenweise runzelig punktiert. Die Basalmakel zieht sich in den Schulterecken auf das Seitendach.......... **P. ceramensis** sp. nov.
Seitenrand hinter den Schultern nicht ausgerandet. Flügeldecken fein punktiert; die Basalmakel reicht nicht auf das Seitendach............ 40.

40. Fühler ganz gelb oder nur die Spitze des letzten Gliedes dunkel. Kopf des Männchens gelb oder nur mit dunklem Fleck. Körper gestreckt, deutlich länger als breit; Seiten der Flügeldecken hinter den Schultern allmählig erweitert.. **P. amboinica** sp. nov.
Fühler in grösserer Ausdehung schwarz oder die Basalglieder mit dunklem Endsaum. Scheitel des Männchens schwarz. Körper gedrungen, nicht länger als breit; Seiten der Flügeldecken schnell erweitert .... **P. octonotata** Boheman.

41. Flügeldecken stark quer gewölbt. Basal dreieck sehr schwach eingedrückt. Hauptgrübchen sehr tief. Fühler dünn, die Endglieder doppelt so lang als dick (Arten aus Celebes)........ **P. impacata** sp. nov.
P. ramigera Boheman.
Flügeldecken nach den Seiten massig gewölbt. Basal Dreieck nicht eingedrückt. Hauptgrübchen seicht .... 42.

42. Scheitel schwarz; die vordere Innenmakel der Flügeldecken ist sehr gross und erreicht die Basis.. **P. sulana** sp. nov.
Scheitel gelb, die vordere Innenmakel ist klein oder fehlt; sie berührt nicht die Basis.. **P. sinuata** Olivier.
P. joloana sp. nov.

ERSTE HAUPTGRUPPE

Die Rinne zwischen der Scheibe des Halsschildes und den Seiten ist in der Mitte durch eine von der Scheibe in die Hinterecken ziehende Wölbung unterbrochen.[1]

Halsschild vor dem Basallappen ohne Grübchen, die Flügeldecken mit einem gemeinsamen Höcker, unregelmässig, seicht punktiert, ohne Andeutung von Rippen; der Nahtrand wird von einer, hinter der Höckerstelle kräftig beginnenden, hinten schwächeren Punktreihe abgesetzt; die Grübchen sind seicht; beide Geschlechter sind hinten verrundet, das Männchen kürzer und breiter, mit breiterem, weniger steil abgesetztem Seitendach.

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[1] Vgl. Weise Deutsch. Ent. Zeitschr. (1897) 100 und Philip. Journ. Sci. § D 8 (1913) 239.

Fühler des Männchens nur wenig länger als beim Weibchen, mit wenig längerem letzten Gliede.

Prioptera decempustulata Boheman. Tafel 1, Fig. 1.

Prioptera decempustulata BOHEMAN, Mon. Cassid. 1 (1850) 55; MAULIK, Fauna Brit. Ind. Cassid. (1919) 316.

Gelb oder rötlich gelb, der Kopf immer gelb; Halsschild mit zwei schwarzen Flecken, näher der Basis als dem Vorderrande, die meist gross, selten klein sind. Flügeldecken mit je vier solchen Flecken in zwei Querreihen; die äusseren zum Teil auf dem Seitendache. Brust und Episternen, ausnahmsweise (Charin Cheba, *Fea,* Museum Genoa) auch ein Teil der Schenkel schwarz; die Fühler gelb, mit dunkler Spitze des letzten Gliedes, viel seltener ist auch die Fühlerspitze gelb, wie dies Boheman angibt. Die Profillinie ist hinter dem Höcker tief, deutlich konkav ausgerandet und hebt den Höcker spitz heraus; die Seiten sind stark ausgeschweift erweitert. Penis dünn, im letzten Fünftel schwach löffelförmig erweitert, dann schnell, sehr schwach ausgerandet verengt, mit kurzer, scharfer, nicht vorgezogener Spitze. Grösse, 11 × 14 bis 13 × 11 Millimeter.

Die typische Form ist besonders auf Sumatra und Malacca häufig; auf Java scheint sie sehr selten. Maulik (l. c.) erwähnt sie, jedenfalls irrtümlich, auch von Vorder-Indien; seine Zweifel an ihrer artlichen Verschiedenheit von *octopunctata* sind ganz ungerechtfertigt.

Bei einer Abart aus Malacca (*parumguttata* m. ab. nov.) fehlen die rückwärtigen Flecke auf den Flügeldecken, während die vorderen, sowie die wenig hinter der Mitte liegenden Halsschildflecke klein sind; Brust und Episternen sind gebräunt.

Im südlichen Borneo, besonders um Pontianak, bildet *decempustulata* eine Lokalrasse, die durchschnittlich kleiner (10 × 9 Millimeter), oben mehr rötlich ist und sich von der Nominatform durch niedrigeren Höcker mit weniger tief ausgerandeter Profillinie und kleinere, vom Vorderrand nicht weiter als von der Basis entfernte Halsschildflecke unterscheidet (*borneensis* m. subsp. nov.). Die Penisform stimmt mit *decempustulata* überein. Ich habe diese Lokalform schon früher erwähnt.[2]

Prioptera nigricollis Weise.

Prioptera nigricollis WEISE, Deutsche Ent. Zeitschr. (1897) 100.

Grösser und breiter als die vorige, mit breiterem, stärker und schneller erweitertem Seitendach, schwächer ausgerandeter

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[2] Saraw. Mus. Journ. 1 (1912) 3.

Profillinie. Der Halsschild ist entweder ganz pechschwarz oder der Saum des Vorderrandes und eine Stelle vor dem Basallappen sind pechrot; das letzte Fühlerglied ist an der Spitze gebräunt oder gelbrot; ausser der Brust und ihren Seitenteilen sind unterseits auch die Schenkel, Schienen, und die Mitte der ersten Sternite schwarz. Der Penis ist breiter als bei *decempustulata,* am Ende weniger ausgezogen, neben der kurz vortretenden Spitze seicht ausgerandet, in der Seitenansicht weniger gebogen.

Ihr Vorkommen scheint auf Nias beschränkt, wo sie die dorther nicht bekannte *P. decempustulata,* der sie mit Ausnahme der obigen Unterschiede vollkommen gleicht, ersetzt. Grösse, 11.5 × 11.5 bis 14 × 13 Millimeter. Bawolovolani (*Modigliani,* Mai, 1886), Lahago (*Kannegieter,* Februar, 1896).

Prioptera sarawacensis Spaeth. Tafel 1, Fig. 2.

Prioptera sarawacensis SPAETH, Saraw. Mus. Journ. 1 (1912) 115.

Im allgemeinen mit *P. decempustulata* gleich gezeichnet, die Halsschildmakeln stehen nahe der Basis und sind meist gross; die Fühlerspitze ist oft angedunkelt, der Kopf stets gelb; unterseits ist nur die Brust schwarz, nicht aber die Episternen; zuweilen ist auch die Unterseite ganz gelb. Die Profillinie ist viel schwächer als bei *decempustulata* ausgerandet oder fast geradlinig, oben aber in einem scharfen Winkel gebrochen. Der Penis ist von seiner grössten Breite an länger zugespitzt, die Seiten sind vor dem Ende schwach, bei seitlicher Ansicht ausgerandet, die Spitze mehr als bei *decempustulata* sehr schwach aufgebogen.

Von *borneensis* ist sie durch die fast gerade Profillinie, niedrigeren, weniger heraustretenden Höcker, dem schwächer eingedrückten Basaldreieck, und die weiter zurückliegenden Halsschildmakeln, von *octopunctata* durch tiefer eingedrücktes Basaldreieck, schärfer abgesetzte Höckerquerkante, ganz gelbem Kopf, weniger auf das Seitendach übergreifende hintere Makel der Flügeldecken, und grössere Gestalt verschieden. Grösse, 11 × 9.5 bis 12.5 × 11 Millimeter.

Borneo: Sarawak (*M. Moulton,* zahlreich), Tandjong (*S. O.*), Brunei, Baradei (*S. O.*, Museum Amsterdam); Mahakkam (*Dr. Nieuwenhuis,* 1894, Leyden).

Die Puppe ist jener von *P. schultzei,* nach der Abbildung die Schultze [3] gegeben hat, sehr ähnlich und als zu *Prioptera* gehörig

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[3] Philip. Journ. Sci. § A 3 (1908) t. 1, f. 8.

sofort daran zu erkennen, dass die sichelförmigen Seitenanhänge des dritten Abdominalsegments nach rückwärts gerichtet sind; sie sind schlanker und länger als bei der abgebildeten Art, ebenso die nach vorne gerichteten Anhänge des ersten und zweiten Segments; jene am vierten und fünften Segment sind rudimentär; alle sind mit zähnchenförmigen Körnchen besetzt.

Das Pronotum ist quer-rechteckig, nach vorne kaum oder nicht verengt, um die Hälfte breiter als das Metanotum, sein Vorderrand tiefer ausgerandet, mit vier kurzen Zapfen. Die Oberseite ist im Inneren fein gekörnt, gelbbraun; auf dem Metanotum sind zwei schwarze Flecke; auf dem ersten bis vierten Ventralsegment liegt jederseits eine nach hinten sich verbreiternde schwarze Längsbinde.

Prioptera vicina sp. nov. Tafel 1, Fig. 3.

Von der äusserst nahestehenden *P. sarawacensis* wahrscheinlich spezifisch verschieden; der Höcker fällt etwas weniger steil nach vorne ab und ist niedriger; das Basaldreieck ist kaum eingedrückt, die Profillinie hinten geradlinig; der Halsschild ist etwas breiter und kürzer und trägt keine Makeln; die Flügeldecken sind vorne an den Seiten weniger ausgeschweift, ihre Flecke klein, rund, die äusseren greifen nicht auf das Seitendach über, die rückwärtigen inneren sind halb erloschen. Das Endglied der Fühler ist schwarz; die Unterseite einfarbig gelb. Der Penis ist im Zusammenlauf tiefer ausgerandet, mit länger vorgezogener Spitze, die bei seitlicher Ansicht nicht vorgezogen erscheint.

Von *P. octopunctata* durch die Grösse, höher ansteigenden, nach vorne steiler abfallenden Höcker, mehr winklig gebrochene Profillinie, breiteren Körper, schmäleren, am Ende mehr zugespitzten, tiefer ausgerandeten Penis, und fehlende Halsschildflecke unterschieden.

Männchen, 11.5 × 9.5 Millimeter; Weibchen, 13 × 10. Süd Palawan (*Waterstradt* Coll.).

Die Typen in meiner Sammlung.

Prioptera octopunctata Fabricus. Tafel 1, Fig. 4.

Prioptera octopunctata FABRICIUS, Mant. Ins. (1787) 63 (Cassida); BOHEMAN, Mon. Cassid. 1 (1850) 53.

Im allgemeinen von der gleichen Färbung und Zeichnung wie *P. decempustulata* und *sarawacensis,* der Scheitel aber häufig pechschwarz oder wenigstens mit zwei dunklen Flecken, unterseits meist nur die Brust schwarz, selten auch die Episternen, zuweilen aber auch unten ganz gelb; an den Fühlern ist mindestens die Spitze des letzten Gliedes gebräunt; die Halsschildflecke sind meist klein und stehen vom Vorder- und Hinterrand gleich entfernt; die rückwärtige Makel des Seitendaches geht bis an den Aussenrand.

Durchschnittlich kleiner als *decempustulata* und *sarawacensis*, weniger breit, mit vorne seichter ausgerandetem Halsschild, hinten weniger erweiterten Flügeldecken; der Höcker ist noch stumpfer als bei *sarawacensis*, mit schwächerer Querkante hinter dem kaum eingedrücktem Basaldreieck; die Profillinie ist hinter dem Höcker gerade, wodurch sich *octopunctata* sicher von *decempustulata* unterscheiden lässt. Der Penis ist von der breitesten Stelle zur Spitze sehr schnell verengt, nur kurz zugespitzt, daher stumpfer, kaum merklich ausgerandet. Grösse, 10 × 9 Millimeter.

Prioptera octopunctata ist hauptsächlich auf Java verbreitet und hier häufig (Pasoeroear, Mount Kawie, Mount Tengger, Zuider Gebirge, etc.) Von Sumatra und Malacca habe ich noch kein Stück mit verlässlicher Fundortangabe gesehen; dagegen kommt sie in Süd Borneo bei Pontianak in einer Form vor, die ganz ähnlich wie die von ebendort stammende *decempustulata* subsp. *borneensis* oben lebhafter rotgelb gefärbt ist, sich aber von dieser durch die gleichen Merkmale wie die beiden typischen Formen unterscheidet.

Bei einer Abart von Java (*fumigata* m. ab. nov.), sind Halsschild und Unterseite wie bei *P. nigricollis* Weise gezeichnet. Halsschild pechschwarz mit hellem Saume vorne und an den Seiten und einem Fleck vor dem Basallappen; unten Halsschild, Brust, Episternen, Mitte der ersten Sternite und Mitte der Schenkel und Schienen schwarz.

Als eine Aberration betrachte ich ferner *P. bipuncticollis* Boheman,[4] bei welcher die Flecken auf den Flügeldecken entweder ganz erloschen sind oder nur der rückwärtige äussere noch schwach erkennbar ist; die Unterseite ist bei allen meinen Stücken einfarbig gelb; nach Boheman soll die Brust angedunkelt sein. Der Penis ist jenem von *octopunctata* ganz gleich gebildet. Auch von dieser Form liegt mir eine Subaberration (*picicollis* m. nov.) vor (Mount Kawie, Pasoeroear), bei der die Flecken auf dem Halsschilde wie bei *nigricollis* auseinander fliessen und die Unterseite in gleicher Weise schwarz ist.

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[4] Cat. Col. Ins. Brit. Mus. 9 (1856) 9; Mon Cassid. 4 (1812) 19.

ZWEITE HAUPTGRUPPE

Seitenrinnen des Halsschildes nicht durch eine Querrinne unterbrochen.

ERSTE GRUPPE. FLÜGELDECKEN GEHÖCKERT

A. Höcker hoch, Profillinie hinter ihm konkav

Prioptera schultzei Weise.

Prioptera schultzei WEISE, Philip. Journ. Sci. § A 3 (1908) 259; SCHULTZE, Philip. Journ. Sci. § A 3 (1908) 263, pl. 6, fig. 1.

Tief schwarz, die Innenecken der Epipleuren und ein schmaler Abdominalsaum rötlich, die Scheibe der Flügel braunrot, weniger glänzend als die übrige Oberseite, tief runzelig punktiert, mit einem, nach der Abbildung anscheinend hinten konkav ausgerandeten, niedrigen Höcker, zwei Rippen, und einem grossen Grübchen zwischen denselben. Grösse, 11 bis 12 Millimeter.

Mindoro, Bongabon.

W. Schultze, der diese mir unbekannt gebliebene Art in allen Entwicklungsstadien auf *Premna integrifolia* Linnæus im Januar, 1908, zahlreich an der Küste von Mindoro fing, hat Eiablage, Larve, und Puppe beschrieben und abgebildet.[5]

Prioptera octomaculata Boheman.

Prioptera octomaculata BOHEMAN, Mon. Cassid. 1 (1850) 56.

Gelb, die Scheiben des Halsschildes und besonders der Flügeldecken rötlich gelb, die Unterseite gelb, die Brust nach Boheman zuweilen mit schwarzer Quermakel; das letzte Fühlerglied mit schwach gebräunter Spitze; auf dem Halsschilde zwei der Basis genäherte, wenig scharfe, dunkle Flecken; Flügeldecken mit je vier Flecken in zwei Querreihen, der rückwärtige äussere zum grössten Teil auf dem Seitendache. Der Höcker ist spitz, herausgehoben, die Profillinie hinter ihm tief konkav ausgerandet; die Scheibe ist grob, ziemlich dicht, stellenweise runzelig punktiert, uneben, neben der Naht gröber punktiert, mit einer undeutlichen Rippe. Mir liegt kein Männchen vor. Grösse, 9 × 8.5 (nach Boheman).

Java (*Boheman*). Nordost-Sumatra, Tandjong, Morawa Serdang (*Dr. Hagen*), Museum Leyden (Weibchen, 10 × 8 Millimeter).

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[5] Philip. Journ. Sci. § A 3 (1908) t. 1, f. 6–8.

Prioptera gibbosa Baly.

Prioptera gibbosa BALY, Journ. Entom. 2 (1863) 9.

Von Tringanee auf Malacca beschrieben, mir unbekannt. Die Zeichnung des Halsschildes und der Flügeldecken sowie die Höckerbildung scheinen ganz gleich zu sein wie bei *P. octomaculata.* Wenn sie von dieser, mit der sie leider vom Autor nicht verglichen wird, sich überhaupt unterscheidet, so könnte der Unterschied nur in der Skulptur der Flügeldecken liegen, welche verworren, erhaben retikuliert, ausser in unregelmässigen Streifen, innen deutlich punktiert sind und je drei weite Grübchen haben. Die Fühler sind ganz gelb; 5 Linien lang.

Prioptera atricornis Spaeth.

Prioptera atricornis SPAETH, Sarawak Mus. Journ. 1 (1912) 116.
Prioptera nigricornis WEISE, Archiv f. Naturg. 78 (1912) 97.

Fühler schwarz mit hellem erstem Glied. Halsschild mit zwei verschwommenen dunklen Flecken. Flügeldecken mit trüb blutroter Scheibe und je vier grossen, zum Teil verschwommenen Flecken; ihre Scheibe mässig stark zerstreut punktiert, ohne Retikulation; Rippen schwach erkennbar, der Höcker hoch und spitz, die Profillinie hinter ihm tief ausgerandet. Penis dünn, löffelförmig, an der Spitze länger und geradlinig zugespitzt, sehr schwach aufgebogen, die Spitze sehr schwach knopfförmig. Grösse, 11 × 9 Millimeter (Männchen).

Borneo: Kuching, Mount Lingga.

Eine mir nur in zwei (Weibchen) Stücken vorliegende Abart unterscheidet sich durch ungefleckten Halsschild, mit dem Seitendach gleichgefärbte Scheibe der Flügeldecken, seichtere Grübchen, kaum angedeutete Rippenansätze. Grösse, 11 × 8.5 Millimeter.

Nord Borneo, Brunei (*Waterstradt*); Sandakan (*C. F. Baker*).

Prioptera gibbifera sp. nov.

Breviter obovata, testacea, prothorace protectoque nitidis, testaceis, disco elytrorum minus nitido, saturatiore, macula utrinque pone medium prope suturam subeffusa, picea, protecto pone medium macula transversa nigropicea cyanescente; elytra lateribus emarginato-ampliatis, apice rotundato, gibbere subacuto, postice emarginato, utrinque sat profunde trifoveolata et bicarinata, sat profunde punctata, interstitiis subreticulato-elevatis; 9 × 7.5 mm.

Bräunlich gelb, die Scheibe der Flügeldecken gesättigter; die Fühler mit Ausnahme des ersten Gliedes schwarz; hinter der Mitte des Seitendaches eine in die Scheibe übergreifende, pechschwarze, blau metallisch glänzende Querbinde; auf der Scheibe ist die Makel 4 durch einen ziemlich scharf begrenzten pechbraunen Fleck markiert, während zwischen Schulterbeule und Höcker nur ein verwaschener rötlichbrauner Fleck die Makel 2 andeutet.

Halsschild mit vorne stark gerundeten, hinten geradlinig und senkrecht zur Basis verlaufenden Seiten und rechtwinkligen zurückspringenden Hinterecken; vor dem Bassallappen ein grosses, tiefes Grübchen; die Flügeldecken an den Seiten zuerst bogig ausgerandet, dann mässig erweitert, hinten breit verrundet; der Höcker ist kurz, spitzig, die Profillinie nach vorne steiler, gerade, rückwärts weniger geneigt, tief konkav; die Scheibe sehr grob punktiert, die Punkte nicht tief, mit eingestochenem Mittelpunkt, ihre Zwischenräume netzförmig; die innere Rippe von der Basis bis über die Höckerquerkante hoch und kräftig, dann durch quergestellte Punkte unterbrochen, vor und in der Makel 4 wieder kräftiger, hier endend; die äussere ist kaum schwächer, bis zum Ende der beiden vorderen Grübchen reichend; von diesen besonders das innere gross und tief, wie die Scheibe punktiert. Der Penis ist schmäler als bei *atricornis,* vor der Spitze weniger erweitert, dann sehr schwach ausgerandet, zugespitzt. Männchen in meiner Sammlung, Weibchen im Museum in Amsterdam.

Südost-Borneo: Barabei.

Von *atricornis* durch die viel kräftigere Skulptur der Flügeldecken, schmäleres Seitendach, und die Grösse verschieden.

Prioptera sumatrana Weise.

Prioptera sumatrana WEISE, Archiv f. Naturg. 78 (1912) 97.

Rötlich gelb mit ganz gleichfarbigen Fühlern; auf dem Halsschilde sind bei dem mir vorliegenden (Weibchen) Stücke zwei sehr kleine, weit von einander entfernte braune Flecke, die Weise nicht erwähnt; auf den Flügeldecken je zwei quere, sehr grosse pechbraune Flecke, welche aussen bis an den Randstreif reichen, innen von ihrem Gegenüber durch den Nahtsaum getrennt werden, der beim vorderen viel breiter ist. Der vordere ist nur durch einen schmalen hellen Saum von der Basis getrennt, reicht bis vor die Mitte und füllt mit seinem inneren letzten Viertel das Haupgrübchen aus; der rückwärtige liegt hinter der Mitte und greift nicht auf das Seitendach über; der vordere scheint sonach aus den Normalflecken 1 und 2, der rückwärtige aus 3 und 4 zusammengeflossen, worauf noch eine bei jedem erkennbare Einschnürung hinweist; die Basalränder des Halsschildes und der Flügeldecken sind kräftig schwarz krenuliert. Der Höcker ist wesentlich niedriger als bei *atricornis* und *gibbifera* und tritt infolge der nur schwachen Ausbuchtung hinter ihm wenig heraus. Die Flügeldecken sind auf der Scheibe ziemlich grob, aber seicht, nur in den Streifen neben der Naht tiefer punktiert, mit zwei schwach angedeuteten, aber bis vor den Abfall erkennbaren Rippen. Die Seiten sind beim Weibchen hinter den Schulterecken sehr wenig ausgerandet, das Ende kurz zugespitzt und unterseits behaart. Weibchen, 10 × 8 Millimeter.

Nias, Lahago (*Kannegieter*).

Weise beschrieb sie nach einem von Geilenkeuser erhaltenen, angeblich aus Sumatra stammenden Stücke; ich halte diese Fundortangabe für fraglich.

Prioptera morigera sp. nov.

Obovata, convexa, modice nitida, testaceo-rufa, antennis articulis 2 ultimis, elytris maculis 4 nigris; prothorax basi leviter foveolatus; elytra leviter emarginato-gibbosa, remote vage punctata.

♂: Antennis longioribus, elytris apice rotundatis; 10 × 8.5 mm.

♀: Antennis brevioribus, elytris apice subacuminatis, protecto minus lato, magis deflexo; 11 × 8.5 mm.

Palawan (*Doherty*); Balabac (*Waterstradt*).

Eiförmig, mässig gewölbt, gelblichrot, die zwei letzten Fühlerglieder und vier Flecke auf jeder Flügeldecke schwarz; diese in der gewöhnlichen Anordnung (2, 2); von den vorderen greift der äussere nicht auf das Seitendach über, der innere ist grösser, schräg oval, in dem grossen Grübchen und auf der Querkante des Höckers, von den rückwärtigen ist der äussere zur Hälfte auf dem Seitendache quer, der innere rundlich. Fühler des Männchens mässig länger als die des Weibchens, ihr letztes Glied um die Hälfte länger als das vorletzte. Halsschild beim Männchen kürzer und breiter als beim Weibchen, dreimal, beim Weibchen 2.5 mal so breit als lang; die Hinterecken beim Männchen rechtwinklig, beim Weibchen sehr wenig spitzer, die Scheibe glatt. Flügeldecken beim Männchen stärker, beim Weibchen schwächer, immer nur mässig und geradlinig erweitert, an der Spitze beim Männchen verrundet, beim Weibchen zugespitzt, die Scheibe sehr stumpf und niedrig gehöckert, die Profillinie in sehr stumpfem, aber scharf ausgeprägtem Winkel gebrochen, nach beiden Richtungen sehr schwach ausgerandet, fast gerade, nach vorne steiler; am Höcker eine niedrige stumpfe Querleiste; die Scheibe ist auf dem Rücken innen flach gedrückt, mit wulstig herausgehobener Nahtrand, sehr weit zerstreut, ziemlich fein (gröber als bei *privigna* und *octopunctata*), in den Grübchen gröber und stärker punktiert, die Punkte stehen verworren, bilden jedoch an der inneren Rippe Ansätze zu kurzen Reihen; diese Rippe ist allein angedeutet; neben der Naht vom Höcker bis hinter die Mitte eine gröbere Punktreihe. Das Seitendach ist beim Männchen in der Mitte breit, fast flach ausgebreitet, beim Weibchen schmäler, schwach geneigt.

Von *privigna* durch schärfer gebrochene, ausgerandete Profillinie, höheren Höcker, tiefer eingedrücktes Basaldreieck, mehr zugespitztes Ende der Flügeldecken des Weibchens, kleinere Flecke verschieden.

Männchen und Weibchen in meiner Sammlung.

B. Höcker stumpf, niedrig, nach rückwarts geradlinig abfallend. Die Fühler des Männchens wenig länger als die des Weibchens

Prioptera privigna Boheman.

Prioptera privigna Boheman, Mon. Cassid. 4 (1862) 20.

Verkehrt-eiförmig, glänzend gelb oder rotgelb, die Brust mitunter mit schwarzem Querfleck, die Spitze des letzten Fühlergliedes schwarz; auf dem Halsschilde zwei schwarze Flecke nebeneinander, auf den Flügeldecken je vier schwarzblau-metallische Flecke, die beiden vorderen eiförmig, der innere in der Grube, nach vorne bis über die Höckerquerkante ausgedehnt, der äussere hinter der Schulterbeule, die beiden rückwärtigen rund, der äussere oft bis an den Rand des Seitendaches ausgedehnt. Die Hinterecken des Halsschildes recht- oder schwach spitzwinklig, das Grübchen auf dem Basallappen meist nur klein, die Scheibe glatt. Die Flügeldecken nach hinten beim Männchen mehr erweitert, hinter den Schulterecken mehr (Männchen) oder kaum (Weibchen) ausgerandet, die Spitze verrundet (Männchen) oder schwach zugespitzt (Weibchen); die Scheibe wie bei *octopunctata* gehöckert und punktiert, also im Basaldreieck schwach eingedrückt, dann mit niedrigem, stumpfem Höcker und rückwärts gerader, oben an der Bruchstelle abgerundeter Profillinie. Die Punktierung ist sehr fein und zerstreut, ohne Spur von Reihen; Rippen fehlen; der Nahtstreif mit einigen gröberen Punkten in der Mitte; die Grübchen tiefer als bei *octopunctata*, gröber punktiert als die Scheibe.

Coll. Spaeth: Singapore (Männchen, Weibchen, ex Coll. Baly), Java (Weibchen). Museum Amsterdam: Java (Weibchen). Museum Leyden: Sumatra, Padang Loeboe Bangkoe (*Menzel*).

Männchen, 10 × 9.5 Millimeter; Weibchen, 11 × 9.5.

Von der äusserst ähnlichen *P. octopunctata* durch nicht unterbrochene Halsschildrinnen verschieden.

Ich beziehe die obige Art auf *privigna,* obwohl Boheman angibt dass diese punktiert-gestreifte Flügeldecken haben soll, weil ich einen Irrtum in der Beschreibung vermute.

Prioptera puellaris sp. nov.

Rotundato-obovata, modice convexa, nitida, laete rufo-testacea, elytris utrinque maculis 4 nigris, antennis flavis vel articulo ultimo basi nigro; prothorax lateribus ad basin subrectangulis, disco laevi, ante lobum leviter foveolato; elytra leviter gibbosa ibique nec emarginata, remote, subtiliter, vage punctata.

♂ : Antennis longis, articulo ultimo penultimo duplo longiore, protecto subdeplanato, latiore, 10 × 8.75 mm.

♀ : Antennis brevibus, articulo ultimo penultimo vix dimidio longiore, protecto subdeflexo, minus lato; 10 × 8.25 mm.

Sumatra, Palembang, Mana Riang Ranau (*Kannegieter,* Coll. Spaeth); Männchen, Typus. Sumatra: Manna (*Knappert,* Museum Leyden); Männchen, Cotypus; Weibchen, Typus.

Lebhaft rotgelb, heller als *morigera;* auf den Flügeldecken vier schwarze Flecke in der gleichen Anordnung; von den vorderen der äussere klein, unter der Schulterbeule, schwach eiförmig, der innere doppelt so gross, in der Hauptgrube und vorne mit der Hälfte über der Höckerquerkante; von den rückwärtigen der äussere zur Hälfte auf dem Seitendach, quer, der innere kleiner, rund.

Der *P. privigna* in der Punktierung der Flügeldecken, Stellung der Makeln auf denselben, und der Höckerbildung ähnlich; flacher, das Männchen hinten weniger erweitert, das Weibchen hinten weniger zugespitzt, auf dem Halsschild ohne Makeln, die Grübchen auf den Flügeldecken und vor dem Basallappen des Halsschildes seichter. Die Fühler einfarbig (Männchen, Typus) gelb oder mit schwarzem, am Ende gelbem Endglied (Männchen, Cotypus; Weibchen, Typus), beim Männchen von mehr als halber Körperlänge, das letzte Glied doppelt so lang als das vorletzte, beim Weibchen um die Hälfte kürzer, die Halsschildecken nicht überragend, das letzte Glied nur wenig länger als das vorhergehende. Halsschild schmäler als bei *morigera,* vorne seichter ausgeschnitten, mit mehr verrundeten

Vorderecken, an den Seiten mehr gerundet, mit fast rechtwinkligen Hinterecken oder zur Basis sogar kaum merkbar verengt; die Scheibe glatt, das Grübchen vor dem Basallappen sehr klein und seicht, die Rinne neben dem Vordach bis vor die Basis tief.

Flügeldecken kürzer und breiter als bei *morigera*, an der Spitze breiter gerundet, hier dichter behaart; der Höcker merklich stumpfer, mit nach hinten geradlinig abfallender, oben schwächer gewinkelter Profillinie; die Scheibe ist fein und zerstreut, feiner als bei *morigera* punktiert, ohne Rippenandeutung, der Punktstreif an der Naht grob; Grübchen kräftiger punktiert. Das Seitendach ist flach, glatt, beim Weibchen schmäler und mehr abfallend als beim Männchen.

Prioptera decemstillata Boheman.

Prioptera decemstillata BOHEMAN, Cat. Col. Ins. Brit. Mus. 9 (1856) 9; Mon. Cassid. 4 (1862) 21; MAULIK, Fauna Brit. Ind. Cass. (1919) 311.

Weibchen.—Wenig glänzend, bräunlich gelb, auf dem Halsschilde zwei schräg gestellte Flecken, auf den Flügeldecken die Nahtspitze schwarz und je vier Flecke schwarz metallisch, auf der Brust eine aussen abgekürzte, schwarze Querbinde, die Vorderschenkel unten mit einem wenig dunkleren Wisch.

Fühler verhältnismässig kurz. Halsschild vor dem Mittellappen mit einem Grübchen und schwach spitzwinkligen Ecken. Flügeldecken an den Seiten kaum merklich ausgerandet, dann mässig erweitert, hinten verrundet; die Scheibe gewölbt, ohne Höcker, aber die Profillinie durch den Eindruck des Basaldreiecks zwischen der Höckerstelle und der Mitte des Halsschildes schwach ausgerandet. Die Scheibe ist grob, ziemlich dicht, in den Grübchen tiefer, auf dem Abfall mässig feiner punktiert, die Punkte beiderseits der ersten und ausserhalb der zweiten Rippe in unregelmässige Streifen gestellt. Die innere Rippe besonders, so lange sie das Basaldreieck abgrenzt, hoch, reicht bis über die Makel 4, während die zweite, kaum niedrigere, in dieser endet; die dritte und vierte Rippe sind nur hinter der Mitte erkennbar. Die Makeln haben die gewöhnliche Anordnung, doch setzt sich die erste, welche auf der Scheibe einzelne Haare trägt, vorne mit einem Ast bis an den Aussenrand des Seitendaches fort, während die zweite über das Hauptgrübchen vorne und innen hinausreicht; die dritte steht je zur Hälfte auf dem Seitendache und der Scheibe, die vierte ist rund, kleiner, die gemeinsame Spitzenmakel klein. Das Seitendach ist, wie immer bei Weibchen, ziemlich schmal, mehr geneigt. Grösse, 10 × 8 Millimeter. Männchen mir unbekannt.

Boheman: India Oriental, Coll. Spaeth: Darjeeling, Tukvar (*F. A. Moeller*), Weibchen.

Boheman hat sonderbarer Weise die sehr wichtige gemeinsame Apikalmakel der Flügeldecken nicht erwähnt. Da aber Maulik seine Beschreibung offenbar nach dem Typus im Britischen Museum, dessen Schätze ihm während seines Aufenthaltes in London zugänglich waren, verfasste, hege ich keinen Zweifel, dass mein Stück zu der von Boheman beschriebenen Art gehört, wobei es mir möglich ist die bisherige allgemein lautende Vaterlandsangabe zu präzisieren, da Maulik's "Assam?" wohl nur aus dem Catalogus Coleopterorum (1914) recipiert wurde.

Prioptera andrewesi Weise.

Prioptera andrewesi WEISE, Deutsch. Ent. Zeitschr. (1897) 99; MAULIK, Fauna Brit. Ind. Cass. (1919) 312, f. 97 (Männchen).

Von der vorigen durch die Grösse, gelben Scheitel, und ungefleckten Halsschild zu unterscheiden; mir unbekannt. Die Flügeldecken mit tiefen verworrenen Punkten, aber neben der Naht mit minder regelmässigen Streifen und mit den normalen vier Flecken, von denen Makel 1 zuweilen verschwimmt, 2 (nach der Abbildung bei Maulik) nicht die Ränder des Hauptgrübchens überschreitet, 3 quer auf dem Seitendach steht, ohne weit in die Scheibe einzudringen; ausserdem die Nahtspitze schwarz. Die Brustmitte bräunlich. Grösse, 12 bis 13 × 10 Millimeter.

Burma, Prome.

Prioptera maerkeli Boheman.

Prioptera maerkeli BOHEMAN, Mon. Cassid. 1 (1850) 57.

Halsschild und Seitendach gelb, die Scheibe der Flügeldecken trüb-blutrot, die Fühler gelb mit schwarzem Endglied, die Unterseite gelb; auf dem Halsschilde zwei dunkle, nicht schwarze Flecke nebeneinander, an der Basis, zwischen ihnen ein seichtes Grübchen; auf den wenig glänzenden Flügeldecken je vier schwarz-metallische Flecke, deren zweiter vorne und innen die Grenze des Hauptgrübchens überschreitet; der erste steht noch auf der Scheibe, der dritte mit seiner grösseren Hälfte auf dem Seitendache, dessen Aussenrand er meist erreicht; der vierte ist rundlich. Fehlen einzelner Flecke scheint nicht vorzukommen.

Flügeldecken beim Männchen geradlinig, stärker erweitert, an der Spitze breiter verrundet, beim Weibchen fast gerade, sehr wenig ausgerandet, weniger erweitert, hinten schwach zugespitzt. Profillinie hinter dem Höcker gerade, fast horizontal. Die Scheibe ist ziemlich grob, tief, mässig dicht punktiert, die erste Rippe schwach ausgebildet. Hauptgrübchen mässig tief. Seitendach glatt, beim Männchen breiter und weniger geneigt. Penis schlank, löffelförmig, an der Spitze breit abgestutzt, ohne Endzapfen, vorher geradlinig verengt, bei seitlicher Ansicht am Ende schwach aufgebogen. Männchen, 9 × 8 Millimeter; Weibchen, 9 × 7.5.

Nur von Java bekannt.

Prioptera quadriimpressa Boheman.

Prioptera quadriimpressa BOHEMAN, Mon. Cassid. 1 (1850) 47.

In der Körperform mit *maerkeli* übereinstimmend. Ganz gelb, nur das letzte Fühlerglied und die Flecke auf den Flügeldecken schwarz; letztere immer klein, der zweite nie die Ränder des Hauptgrübchens überschreitend, der erste und vierte öfters, der zweite und dritte selten erloschen. Scheibe mit lackartigem Glanz; das Hauptgrübchen sehr tief, auch die anderen Grübchen tiefer als gewöhnlich. Die Scheibe mässig grob, wenig dicht, hinten feiner punktiert, neben der Naht durch eingestreute Querwulste oft runzelig; von den Rippen oft nur die innerste bis in die Makel 4 deutlich. Profillinie hinten gerade. Männchen breiter, mehr (beide Geschlechter fast geradlinig) erweitert, hinten breiter verrundet, mit breiterem, weniger geneigtem Seitendach. Penis löffelförmig, wie bei *maerkeli* aber an der Spitze schmäler abgestutzt, vorher tiefer ausgerandet. Männchen, 9.5 × 8 Millimeter; Weibchen, 6.5 bis 11 × 8.

In den Gebirgen von Java häufig.

Prioptera palawanica Weise.

Prioptera palawanica WEISE, Philip. Journ. Sci. § D 8 (1913) 239.

Auf diese mir bisher unbekannte Art beziehe ich ein mir aus dem Britischen Museum vorliegendes Männchen ohne Fundortangabe, das in einigen Punkten von der Beschreibung Weise's abweicht.

Männchen.—Umriss fast quadratisch, hinten sehr breit abgerundet, kaum um ein Viertel länger als breit. Weissgelb, viel heller als *quadriimpressa.* Die Fühler ganz gelb (nach Weise beim Typus das letzte Glied schwarz; der Halsschild schwach, die Flügeldecken kaum glänzend). Halsschild sehr breit, mit rechtwinkligen Hinterecken, parallel nach vorne laufenden Seiten, sehr breit verrundeten Vorderecken, und tiefem Kopfausschnitt; die Seiten sonach weniger und vorne in grösserem Bogen konvergierend als bei *quadriimpressa.* Basalgrübchen fast erloschen. Flügeldecken kaum länger als breit, viel kürzer und breiter als bei *quadriimpressa,* mit sehr breitem Seitendach, das an der breitesten Stelle halb so breit ist als eine Flügeldecke; die Profillinie hinter dem sehr niedrigen, kaum angedeuteten Höcker gerade; die Scheibe sehr fein eingestochen, undeutlich punktuliert, mit je vier scharf begrenzten runden Makeln, die etwas grösser als bei *quadriimpressa* sind. Nach Weise nimmt Makel 2 das Hauptgrübchen und einen Teil davor ein, und die Makel 3 steht auf dem Seitendach quer mit einer Erweiterung auf die Scheibe. Bei dem mir vorliegenden Stücke ist die Makel 2 auf das Hauptgrübchen eingeschränkt, die Makel 3 steht am Rande der Scheibe und greift kaum auf das Seitendach über. Hauptgrübchen grösser, aber seichter als bei *quadriimpressa.* An der auffällig breiten, kurzen Körperform, der weissgelben, matten Färbung leicht kenntlich.

Männchen, 8.5 × 8 Millimeter (nach Weise 9 bis 9.5 Millimeter).

Palawan, Bacuit.

Typus im Museum Manila.

Prioptera bimaculata Thunberg.

Prioptera bimaculata Thunberg, MAULIK, Fauna Brit. Ind. Cass. (1919) 317.

Prioptera bimaculata ab. *impustulata* BOHEMAN, Mon. Cassid. 1 (1850) 46, t. 2. f. A; MAULIK, Fauna Brit. Ind. Cass. (1919) 316.

Wesentlich breiter und kürzer, nach hinten stärker verbreitert als *quadriimpressa,* mit in beiden Geschlechtern viel breiterem Seitendach. Gelb, nur das letzte Fühlerglied schwarz, auf dem Seitendache hinter der Mitte eine Makel, die entweder blau-metallisch, breit, oder pechbraun, verloschen, und klein ist oder ganz fehlt (*impustulata* Boheman). Die Flügeldecken sind im Basaldreieck ziemlich tief eingedrückt, dahinter in einen niedrigen, stumpfen Höcker erhoben, dessen Profillinie hinten gerade, vorne schwach ausgerandet ist. Die Hauptgrube ist gross und tief, wie die Nebengruben gröber punktiert; auf der Scheibe ist die Punktierung fein, weitzerstreut, stellenweise unregelmässig gereiht, auf dem Nahtrücken gröber, auf dem Abfall fast erloschen. Drei breitere, flache, kaum heraustretende glatte Rippen sind oft nur schwer erkennbar. Beim

Weibchen ist das Seitendach kaum schmäler und geneigter als beim Männchen, hinten etwas mehr zugespitzt, das letzte Fühlerglied des Männchens ist nur wenig länger, aber etwas schlanker als das des Weibchens, nur um die Hälfte länger als breit. Der Penis ist dünn, lang, sehr gleichmässig, langsam zulaufend erweitert, dann geradlinig verengt, an der Spitze kaum abgestutzt, ohne Zäpfchen. Grösse, 11 × 10 Millimeter.

Tenasserim (*Helfer* im Museum Prag); Pegu: Palon (*Fea*, Museum Genoa), Charin Cheba (*Fea*), und Siam (Coll. Spaeth). Dagegen dürfte die alte Vaterlandsangabe "China" kaum richtig sein.

Prioptera rugosipennis Spaeth.

Prioptera rugosipennis SPAETH, Stett. Ent. Zeit. **62** (1901) 3.

Schmutzig weissgelb, mit gesättigterer Scheibe der Flügeldecken, die zwei letzten Fühlerglieder dunkel; die Flügeldecken mit je vier normal gestellten Flecken, die meist nur braun sind und Tendenz zum Verlöschen zeigen; der zweite in der Hauptgrube, nach vorne und aussen nur wenig darüber hinausgehend, der dritte auf dem Seitendache, wenig in die Scheibe übergreifend; diese ist bis zur Spitze dicht, grob und tief mit verworrenen, glasig gehöften Punkten besetzt, schwach runzelig; die Rippen sind nur vorne hoch, die innere erlischt in der Makel 4, die äussere, sehr kurze, schon neben dem Hauptgrübchen; letzteres fällt von ihnen tief ab. Grösse, 7 × 6.2 Millimeter. Weibchen unbekannt.

Ost Sumatra, Soekaranda, Lanka Deli (Museum Stettin und Coll. Spaeth).

C. Höcker niedrig, hinten geradlinig ablaufend. Fühler des Männchens viel länger als die des Weibchens, mit langem Endglied

Prioptera sexmaculata Boheman.

Prioptera sexmaculata BOHEMAN, Mon. Cassid. **1** (1850) 49; MAULIK, Fauna Brit. Ind. Cass. (1919) 314.

Prioptera maculipennis BOHEMAN, Mon. Cassid. **1** (1850) 50; MAULIK, Fauna Brit. Ind. Cass. (1919) 313; Rec. Ind. Mus. **9** (1913) 109.

Prioptera punctipennis WAGENER, Mitt. Münch. Ent. Ver. **1** (1877) 59; MAULIK, Fauna Brit. Ind. Cass. (1919) 314.

Prioptera rugosa BALY, Journ. Ent. **2** (1863) 8.

Die obige Zusammenziehung begründe ich bei *P. punctipennis* Wagener und *P. rugosa* Baly auf die in meiner Sammlung befindlichen Cotypen dieser Autoren; bezüglich *P. maculipennis* sagt Boheman allerdings dass nur das letzte Fühlerglied schwarz ist, so dass sie also garnicht in diese Gruppe gehören würde; doch kommen, wie im Folgenden noch näher erwähnt werden wird, ausnahmsweise Stücke vor bei welchen das zehnte Glied an der Basis noch hell ist, und könnte ein solches Tier Boheman gerade als Typus seiner *maculipennis* beschrieben haben; andrerseits sagt Maulik, der seine Beschreibung nach dem von ihm (l. c.) erwähnten, von Boheman handschriftlich bezettelten Tiere des Britischen Museums verfasst haben dürfte, dass die zwei letzten Fühlerglieder bei *maculipennis* schwarz sind.

Rötlich gelb, die Unterseite meist einfarbig gelb, selten das Metasternum mit pechschwarzen Querfleck, die zwei lezten Fühlerglieder schwärzlich; ausnahmsweise bei einem von Helfer in Tenasserim (Museum Prag) gesammelten Weibchen das zehnte Glied in der Basalhälfte noch gelb; der Halsschild zuweilen mit zwei unbestimmt begrenzten braunen Flecken; die Flügeldecken stets mit einer breiten, blauschwarzen Quermakel hinter der Mitte des Seitendaches (*rugosa* Baly), meist auch mit 1 bis 3 Flecken auf der Scheibe; am häufigsten fehlt die Makel hinter der Schulter (*sexmaculata* Boheman), seltener auch die am Ende der Dorsalrippe, oder die vordere innen; letztere steht in dem Hauptgrübchen, das sie nicht überschreitet; sind alle vier Flecke ausgebildet, so liegt, wenn das Metasternum gelb ist, *punctipennis* Wagener, andernfalls *maculipennis* Boheman vor.

Halsschild vorne sehr tief ausgerandet, mit rechtwinkligen Hinterecken und tiefen Basalgrübchen. Flügeldecken hinter den Schulterbeulen an den Seiten nicht ausgerandet, beim Männchen mit konvexer Andeutung, beim Weibchen ganz gerade bis nach der Mitte erweitert, an der Spitze beim Männchen verrundet, beim Weibchen etwas zugespitzt; das Seitendach ist beim Männchen breiter und flacher ausgebreitet als beim Weibchen. Die Scheibe ist grob und dicht runzelig punktiert, die Zwischenräume der Punkte sind schmäler als diese (nur bei dem Cotypus von *punctipennis* breiter), die Punkte in den Hauptgrübchen noch tiefer und gröber, während die Seitengrübchen selbst fast verloschen und durch eine weitmaschigere Punktierung kenntlich sind; die innere Rippe ist sehr hoch und erlischt in der rückwärtigen Deckenmakel; die zweite Rippe erreicht nur das Hauptgrübchen.

Der Penis ist mässig schlank, nach einer sehr seichten Ausrandung wenig verbreitert, dann mit tieferer Ausrandung verengt und in eine kurze stumpfe Spitze ausgezogen. Beim

Weibchen sind die Epipleuren an der Spitze kaum stärker als beim Männchen behaart. Grösse, 10 × 8.5 Millimeter.

Assam: Mangaldai (*Maulik*), Nepal: Dekhut (*Maulik*); Burma, Charin Cheba (*Fea*, 1888, Museum Genoa), Tenasserim (*Helfer*, Museum Prag); Siam (ex Coll. Baly), Calcutta? (Coll. Spaeth); Khasia Hills (Coll. Spaeth); Tonkin, Hoabinh (*R. V. de Salvaza*, August, 1918, British Museum.)

Prioptera secreta sp. nov. Tafel 1, Fig. 6.

♂, ♀: Late obovata, convexa, nitida, rufo-testacea, antennis articulis 2 ultimis nigris, pectore vitta apicali transversa nigra, protecto pone medium vitta lata transversa nigro-cyanescente, elytris interdum litura parva pone callum humeralem, maculaque pone medium subeffusis nigris; prothorax lateribus late deplanatis; elytra ultra medium valde ampliatis, lateribus rectis, disco obsolete gibboso, sat profunde, crebre, subrugose punctato, utrinque sat profunde trifoveolato et bicarinato, protecto latissimo, laevi; epipleuris apice ciliatis.

♂: Antennis longis, ultimo elongato, penultimo duplo longiore, elytris apice late rotundatis. 9 × 8.5 a 11 × 10 mm.

♀: Antennis brevioribus, ultimo incrassato, penultimo dimidio longiore, elytris apice subacuminatis. 11.5 × 10 mm.

Laos, Tonking, Ha-Lang (Coll. Spaeth).

Mässig gewölbt, glänzend, rötlich gelb, die zwei letzten Fühlerglieder ganz schwarz, die Brust hinten mit schwarzer Querbinde, das Seitendach hinter der grössten Breite mit einer breiten, blauschwarzen, metallisierenden Binde; bei dem einzigen mir vorliegenden Weibchen (aus Ha-Lang) sind auch auf der Scheibe der Flügeldecken noch je zwei verloschene schwarze Flecke erkennbar, entsprechend den Makeln 1 und 4.

Prioptera secreta ist grösser, besonders aber breiter und nach rückwärts stärker erweitert als *sexmaculata*, verhältnismässig weniger gewölbt, mit stärker glänzender Scheibe der Flügeldecken; das Seitendach ist viel breiter, beim Männchen übrigens wesentlich breiter und weniger geneigt als beim Weibchen.

Die Basis der Flügeldecken ist so breit als der Halsschild, die Seiten sind sodann, wie bei *sexmaculata* geradlinig, in beiden Geschlechtern sehr stark erweitert (bei den folgenden Arten dagegen schwach bogig!), hinten beim Männchen breit verrundet, beim Weibchen zugespitzt. Die Punktierung der Scheibe grob, auch auf dem Abfall nicht feiner, aber viel weniger dicht als bei *sexmaculata;* die breit gewölbten Rippen treten kräftig hervor, sind aber stellenweise durch die Runzeln unterbrochen, die erste, besonders, solange sie das Basaldreieck begrenzt, ist hoch und endet erst an der Stelle wo sonst die Makel 4 ist, die äussere zieht sich bogig um die Hauptgrube, wird dann schwächer und endet neben der inneren. Die Grübchen sind tief, kaum schwächer als bei *sexmaculata.* Das Grübchen auf dem Basallappen des Halsschildes ist tief, rundlich. Der Penis ist dünn und schmal löffelförmig, am Anfang dünner, vor der Spitze etwas breiter als bei *pudica,* an den Seiten sanft, aber mehr als bei dieser erweitert, vor der kaum abgestutzten Spitze fast gerade, länger als *pudica* zugespitzt; gegenüber *opima, cerata,* und *encausta* ist er viel schlanker und dünner, ganz abweichend.

Prioptera encausta sp. nov. Tafel 1, Fig. 8.

Obovata, modice convexa, nitida, rufo-testacea, antennis articulis 2 ultimis nigris, pectore vitta transversa picea, elytris maculis utrinque 3 nigropiceis, nempe: 1. magna, transversa pone basin, 2. in protecto postico et disco exteriore transversa, 3. pone medium prope suturam; elytra lateribus leviter curvato-ampliatis, disco leviter gibboso, basi retusa, utrinque profundius trifoveolata, subtiliter, ad suturam tantum profundius punctata, obsolete bicarinata.

♂ : Antennis longissimis, articulo ultimo apice flavo, elytris apice rotundatis. 11 × 9.5 mm.

♀ : Antennis multo brevioribus, elytris apice subacuminatis. 11.5 × 9.7 mm.

Lackglänzend, gelblichrot, auf der Brust hinten eine pechschwarze Querbinde; die zwei letzten Fühlerglieder schwarz; auf den Flügeldecken sind ausser der Querbinde hinter der Mitte des Seitendaches, die in die Scheibe übergreift, noch je zwei braune bis schwarze Flecke; der vordere sehr gross, quer, aus den zwei vorderen zusammengeflossen, an der Schulterbeule, aussen von der vorletzten Punktreihe begrenzt, reicht er innen bis in die Hauptgrube und zieht sich vorne um die Schulterbeule; der zweite Fleck ist die Makel 4, beide Flecke zuweilen wenig scharf. Die Fühler sind beim Männchen sehr lang, von mehr als halber Körperlänge, dünn, zur Spitze wenig verdickt, ihr letztes Glied gut doppelt so lang als das vorletzte; die Fühler des Weibchens sind nur halb so lang, zum Ende verdickt. Die Grube vor dem Mittellappen des Halsschildes ist seicht. Die Flügeldecken sind an den Seiten beim Männchen sehr wenig konvex gerundet, beim Weibchen in schwachem Bogen ausgerandet erweitert, nach der Mitte am breitesten, an der Spitze beim Männchen breit verrundet, beim Weibchen schwach zugespitzt; die Scheibe ist stumpf gehöckert, rückwärts mit gerader Profillinie, im Basaldreieck ziemlich tief eingedrückt, ziemlich fein, auf dem Abfall feiner und zerstreut, auf dem Rücken hinter dem Höcker und in den Gruben viel tiefer punktiert; letztere sind sehr tief. Die Rippen sind schwach, im rückwärtigen Teil oft nur durch die beiderseitige Punktreihe hervorgehoben. Das Seitendach ist glatt, beim Männchen wesentlich breiter und weniger geneigt als beim Weibchen, innen an der Seitendachbrücke schwach gewölbt, vor- und hinterher mit flachem Eindruck. Der Penis ist am ähnlichsten jenem von *cerata,* aber breiter und kürzer, stärker winklig erweitert, wie bei *cerata* mit der grössten Breite am Beginn der Verbreiterung und hier oben ebenfalls mit einer Querleiste, dann schwach verengt, schliesslich schneller gebogen zugerundet, an der Spitze mit einem kürzeren, breiter verrundeten Zäpfchen.

Im übrigen ist sie von *cerata* durch längere und dünnere Fühler des Männchens, flachere, breitere, hinten mehr erweiterte Flügeldecken, mit mehr gerundeten Seiten und kräftigerer Punktierung auf dem Abfall, und breiteres Seitendach verschieden. Von *opima* ist sie ausser der Zeichnung durch feinere Punktierung des Abfalls, breitere, flachere Gestalt, und ganz andere Bildung des Penis verschieden; von *westermanni* durch weniger gewölbte, hinten stärker verbreiterte, gröber punktierte Flügeldecken, breiteres, am Anfang stärker konvex gerandetes Seitendach, dünnere, längere Fühler, und anderen Penis.

Cochinchina. Die Typen in meiner Sammlung. Ein Cotypus im Britischen Museum.

Prioptera pudica sp. nov. Tafel 1, Fig. 5.

Obovata, lurido-testacea, vertice, pectore abdomineque medio piceis, femoribus fuscescentibus, protecto macula transversa atra coerulescente; elytris haud rugosis, subtilius punctatis, haud carinatis, lateribus leviter curvatis, protecto minus lato.

♂ : 9½ × 8¾ mm; ♀ : 10 × 9 mm.

Die Scheibe des Halsschildes mit Ausnahme der helleren Mittellinie und eines ebensolchen Aussenstreifs schmutzig gelbbraun, ebenso die Scheibe der Flügeldecken und der Scheitel; die Hinterbrust und die Mitte des Hinterleibs pechschwarz, die sonstige Ober- und Unterseite weisslich gelb, die Mitte der Schenkel angedunkelt; hinter der Mitte des Seitendaches ist eine breite, schwarz metallische Querbinde; die letzten zwei Fühlerglieder schwarz. Grübchen auf dem Basallappen des Halsschildes gross und tief.

Die Seiten der Flügeldecken sind schwach gebogen erweitert, mit der grössten Breite hinter der Mitte; das Seitendach ist nicht breiter als bei *encausta,* schmäler als bei *secreta;* die Bildung der Profillinie ist die gleiche; die Scheibe ist ziemlich fein, nur in den Grübchen und auf dem Rücken neben der Naht gröber, runzelig, auf dem Abfall ein wenig feiner, hier nicht runzelig punktiert; ausser den gewöhnlichen drei, mässig tiefen Grübchen sind hinter der Mitte noch je zwei seichtere die die ersteren bogig gegen die Naht fortsetzen; die Rippen sind kaum erkennbar, auch vorne. Die Spitze der Epipleuren ist selbst beim Männchen stark behaart; der Penis ist schmal und dünn, löffelförmig, bis nahe der Spitze äusserst wenig erweitert, dann schnell zugespitzt, am Ende schmal abgestutzt. Das Weibchen ist hinten stumpf zugespitzt und hat schmäleres, mehr geneigtes Seitendach.

Von *P. encausta* und *cerata* durch viel kürzere Fühler, dunklen Scheitel, kürzeren, hinten breiter verrundeten Körper, weniger tiefe Grübchen der Flügeldecken, und ganz andere Penisbildung verschieden.

China, Koug-Tchéon, Koug-Yang, Fou (2 Männchen); Yunnan (Männchen, Weibchen); Typen in meiner Sammlung.

Prioptera cerata sp. nov. Tafel 1, Fig. 7.

♂. Obovata, nitida, rufo-testacea, antennis articulis 2 ultimis, summo apice excepto nigris, elytris vitta postica protecti maculaque parva postica prope suturam nigro-cyanescentibus; antennae longae, apice incrassatae, articulo ultimo penultimo duplo longiore; prothorax ante lobum foveola, lateribus furca ad basin separatis; elytra, lateribus haud convexis, leviter gibbosa, utrinque trifoveolata, in foveolis et ad suturam profundius, ceterum subtiliter punctatis, carinis vix perspicuis; protectum latum laeve, ante et pone parum impressum; 10 × 8$\frac{3}{4}$ a 11 × 9 mm.

Cochinchina.

Gelblich rot, auf dem Seitendache hinten eine Querbinde, auf den Flügeldecken eine kleine Makel hinten neben der Naht (4) schwarz blau-metallisch. Die zwei letzten Fühlerglieder schwarz, das letzte mit gelber Spitze, doppelt so lang als das vorletzte, bis über die Mitte schwach verbreitert, dann aussen winklig gebogen, zur Spitze gleich breit, im Profil flach gedrückt; auf dem Halsschilde ist jederseits ein undeutlicher, kleiner, bräunlicher Fleck. Die Flügeldecken sind stump gehöckert, mit tiefen Gruben; die Punkte der Scheibe sind auf dem Rücken neben der Naht und in der vorderen, äusseren Grube sehr grob und tief, in der Hauptgrube und der rückwärtigen mässig stark, vorne ganz verloschen, auf dem Abfall sehr fein eingestochen. Die innere Rippe ist hinten kaum erhaben, aber durch beiderseitige Punktreihen abgegrenzt und endet im dunklen Fleck; die äussere Rippe ist nur zwischen den beiden vorderen Gruben sichtbar; die Seiten sind über die Mitte geradlinig erweitert; das Seitendach ist breit, flach ausgebreitet, vor und nach der Seitendachbrücke nur wenig innen eingedrückt, dazwischen nur schwach gewölbt.

Der Penis ist an der Basis röhrenförmig, dann flach gedrückt und kurz geradlinig verbreitert, an der breitesten Stelle mit einer geraden Querkante hinter einer breiten, seichten Aushöhlung, dann lang, aber wenig verengt, vor dem Ende schnell, sehr schwach gerundet verengt, an der Spitze mit einem kurzen, abgerundeten Zäpfchen. Im Vergleiche mit jenem von *westermanni* ist er schmäler, an den Seiten am Anfange und Ende der Verbreiterung winklig gebogen, statt gerundet, und mehr konvergierend, die Querkante nicht im Bogen verlaufend. Gegenüber jenem von *opima* ist er viel schmäler und länger und seine grösste Breite liegt am Anfange der Verbreiterung, bei *opima* an deren Ende; die Spitze is bei dieser Art viel breiter verrundet, mit stärker gebogenen Seiten und breiterem, kürzerem Zäpfchen. Gegen jenen von *encausta* ist er schmäler und länger, sowohl die Verbreiterung wie die Verengung zur Spitze erfolgen nicht so schnell, dass Zäpfchen ist viel schmäler.

Im Uebrigen ist *cerata* von *pudica* und *opima* durch die viel feinere, spärliche, eingestochene Punktierung der rückwärtigen Hälfte der Flügeldecken, von *pudica* überdies dürch längere Fühler des Männchens und stärker verdicktes, längeres letztes Glied derselben verschieden. Gegenüber *westermanni* ist das Männchen im allgemeinen kürzer und breiter, nach hinten mehr verbreitert, mehr braunrötlich, die Scheibe der Flügeldecken ist unebener, tiefer, aber zerstreuter punktuliert, das Seitendach ist breiter, in der Mitte nach dem Rande zu viel weniger gewölbt, vor und hinter dieser Stelle weniger eingedrückt.

Drei Männchen in meiner Sammlung aus jener von Donckier.

Prioptera opima sp. nov. Tafel 1, Fig. 9.

♂. Antennae flavae, articulis duobus ultimis, apice ultimi excepto, nigris; subtus testacea, supra flavo-testacea, disco elytrorum fulvo-testaceo, pone medium ad suturam macula parva rotunda nigra, protecto macula transversa postica in discum parum exeunte atro-cyanescente; elytra carinis obsoletis, foveolis profundis, disco mediocriter, apice parum subtilius, dorso medio profundius punctatis, lateribus leviter curvatis, apice breviter rotundato. 11 × 9 mm.

Tonking, Hainan, 1 Männchen (Coll. Spaeth).

Männchen.—Verkehrt-eiförmig, erst hinter der Mitte am breitesten, länger, gestreckter und an den Seiten mehr gerundet als *pudica,* viel länger, dabei weniger verbreitert als *secreta.* Unterseite, Fühler, Halsschild, und Seitendach der Flügeldecken gelb mit wenig rötlichem Stich, das zehnte Fühlerglied und die Basalhälfte des letzten schwarz, auf der Scheibe des Halsschildes jederseits ein bräunlicher, verloschener Wisch, die Scheibe der Flügeldecken gesättigter rotgelb, mit je einer kleinen, nicht scharfen, runden, pechschwarzen Makel hinten neben der Naht, daneben auf dem Seitendache und in die Scheibe übergreifend eine blauschwarz metallische Binde.

Die Fühler des Männchens sind auffällig lang, fast von der doppelten Länge des Halsschildes, dabei dünn, länger als bei *pudica,* ähnlich wie bei *bisignata;* ihr letztes Glied ist doppelt so lang als das vorletzte, in der Mitte der Aussenseite schwach gewinkelt, von da an gelb. Halsschild doppelt so breit als lang, mit vorne stark konvergierenden, gerundeten Seiten und kaum mehr als rechtwinkligen Hinterecken; das Grübchen vor dem Basallappen klein, rund, ziemlich tief, die Scheibe sonst glatt. Die Seiten der Flügeldecken von der Basis an in schwachem Bogen gerundet erweitert, ohne Spur einer Ausrandung, die Spitze breit verrundet. Die Scheibe mit derselben stumpfen Höckerbildung wie *pudica,* mit deutlich winklig gebrochener Profillinie; das Basaldreieck ziemlich tief eingedrückt, aussen von dem breit rippenförmigen, herausgewölbten dritten Zwischenraum begrenzt, innen durch die ebenso gewölbte Naht geteilt; der erwähnte Zwischenraum setzt sich bis in die Makel 4 herausgewölbt fort und ist besonders hoch neben der sehr tiefen Hauptgrube; die zweite Rippe ist schwächer und weniger scharf, ebenfalls bis in die Makel 4 fortgesetzt. Der Rücken zwischen Naht und erste Rippe ist zwischen der Höckerstelle und der kleinen Makel platt gedrückt, mit drei unregelmässigen, gröberen Punktreihen.

Die übrige Scheibe ist mässig grob, nur in den Grübchen tiefer und stärker, hinten kaum feiner punktiert, von *pudica* dadurch verschieden dass bei dieser die Rippen schon in der Mitte verlöschen, die Punktierung feiner, auf dem Abfall noch feiner, auf dem Rücken aber gröber ist. Gegen *westermanni* ist die Punktierung viel gröber, kräftiger, und tiefer, die Scheibe überhaupt, besonders aber auf dem Abfall, viel unebener, und die Rippen treten stärker hervor; das Seitendach ist breiter, flacher ausgebreitet, in der Mitte weniger gewölbt, vor und nach der Seitendachbrücke weniger tief eingedrückt; die Flügeldecken sind kürzer, hinten breiter erweitert, an der Spitze breiter verrundet; das letzte Fühlerglied ist wesentlich schlanker.

Der Penis ist gross und dick, gleich anfangs auf die doppelte Breite löffelförmig erweitert, diese Verbreiterung ist bis vor die Spitze noch weiter sehr schwach erweitert, hier dann am breitesten, dann breit zugerundet, mit einem kleinen, runden Zäpfchen an der Spitze.

Prioptera westermanni Boheman. Tafel 1, Fig. 10.

Prioptera westermanni Boheman, MANNERHEIM, Bull. Soc. Nat. Mosc. 17 (1844) 864; Mon. Cassid. 1 (1850) 45; MAULIK, Rec. Ind. Mus. 9 (1913) 109; Fauna Brit. Ind. Cassid. (1919) 317.

Länger und schmäler, höher gewölbt, viel feiner auf den Flügeldecken punktiert als die verwandten Arten. Gelblich rot; an den Fühlern die zwei letzten Glieder schwarz, beim Männchen das letzte mit gelber Spitze; die Brust meist mit einem schwarzen Querfleck; auf den Flügeldecken nur die rückwärtigen Flecke und zuweilen Makel 3 quer auf dem Seitendach, kaum übergreifend auf die Scheibe, 4 klein, rund. Halsschild normal mit einem kleinen Grübchen vor dem Mittellappen, welches jedoch bei einem von Mouhot in Laos gesammelten Weibchen meiner Sammlung fehlt. Die Flügeldecken mit stark gewölbter, mit Ausnahme der Grübchen ganz ebener Scheibe und ziemlich dichten, äusserst feinen, eingestochenen, mit einem kleinen Hof eingefassten Pünktchen, ähnlich wie in der Gruppe der *octopunctata;* in den Grübchen sind die Punkte grösser, aber kaum tiefer, auf dem Rücken neben der Naht gröber und tiefer. Die Rippen sind nur vorne angedeutet, auch die Innenrippe tritt weiterhin nicht mehr leistenförmig heraus, sondern ist nur durch die begleitenden Punktreihen erkennbar. Das Seitendach ist besonders in seiner Mitte nach aussen stark gewölbt, innen vor und nach der Seitendachbrücke mit tieferen Gruben, beim Männchen viel breiter und weniger geneigt als beim Weibchen, welches auch hinten viel mehr zugespitzt ist. Der Penis ist anfangs röhrenförmig, dann flach gedrückt und schuhförmig verbreitert, hierauf langsam und wenig verengt, schliesslich zugerundet und in ein kurzes Zäpfchen ausgezogen; sowohl die Verbreiterung wie die Verengung geschehen in Bogenlinien, ohne Winkel; die grösste Breite liegt nahe dem Beginne der Verbreiterung; gegen *opima* ist er schmäler und länger, mit viel längerer Verbreiterung, die in schwächerer Ausbuchtung beginnt, früher ihre grösste Breite erreicht, auch die Verjüngung am Ende geschieht langsamer. Männchen, 11 × 9 bis 13 × 10.5 Millimeter; Weibchen, 11 × 9 bis 13 × 10.

Hinter-Indien: Laos, Tonking, Annam.

Prioptera multiplagiata Wagener. Tafel 1, Fig. 11.

Prioptera multiplagiata WAGENER, Mitt. Münch. Ent. Ver. 5 (1881) 26; MAULIK, Rec. Ind. Mus. 9 (1913) 109; Fauna Brit. Ind. Cassid. (1919) 318.

Weisslich gelb, die zwei letzten Fühlerglieder (mit Ausnahme der Spitze des letzten beim Männchen) schwarz; auf den Flügeldecken normal jederseits sechs dunkle Flecke: drei in den Grübchen, alle klein, ausserdem ein strichförmiger hinter der Schulter (Makel 1), ein querer hinten auf dem Seitendach, auf die Scheibe wenig übergreifend (3), und ein kleiner neben der Naht vor dem Abfall (4); zuweilen noch zwei kleine strichförmige Flecke hinter der Schulterbeule; Maulik erwähnt (l. c., 1913) eine in zwei Stücken im Indian Museum in Calcutta vorhandene Abart, bei der die äusseren und rückwärtigen Flecke zu einer von der Schulter über die Dachmakel bis zur Naht gehende Binde zusammengeflossen sind.

Kürzer und breiter, weniger gewölbt, hinten mehr erweitert als *westermanni*, mit flacherem, breiterem, nach aussen nicht gewölbtem Seitendach; die Punktierung der Flügeldecken wenig gröber; die Rippen zu beiden Seiten des Hauptgrübchens vorne sehr kräftig, die äussere hier so hoch und kräftig wie die innere, aber noch neben dem Hauptgrübchen erloschen, die innere auf die rückwärtige Hälfte der Flügeldecken nur schwach fortgesetzt.

Der Penis ist am ähnlichsten jenem von *chinensis*, viel schmäler, weniger verbreitert wie bei *westermanni*, spatelförmig, am Beginn der Verbreiterung am breitesten, dann sehr langsam und schwach verengt, schliesslich kurz zugespitzt und kaum ausgebuchtet, mit wenig heraustretendem Zäpfchen. Männchen, 11 × 10 Millimeter; Weibchen, 10 × 9.

Andamanen.

ZWEITE GRUPPE. FLÜGELDECKEN OHNE DEUTLICHEN HÖCKER, IM BASALDREIECK KAUM ODER NICHT EINGEDRÜCKT

A. Flügeldecken verworren punktiert; Fühler des Männchens viel länger als die des Weibchens

Prioptera chinensis Fabricius. Tafel 2, Fig. 2.

Prioptera chinensis FABRICIUS, Syst. Ent. Suppl. (1798) 84; Syst. El. 1 (1801) 402; WEISE, Verh. Naturf. Ver. Brünn 48 (1910) 42.
Prioptera satrapa BOHEMAN, Mon. Cassid. 4 (1862) 17.

Die grösste Art der Gattung.

Männchen.—Breit gerundet, viel breiter und gerundeter als das längere, schlankere, hinten schwach zugespitzte Weibchen. Gelb, der Scheitel des Männchens mit zwei schwärzlichen Flecken (selten auch beim Weibchen). Halsschild zuweilen mit Andeutung verschwommener, bräunlicher Flecken beiderseits der Mitte. Flügeldecken nur hinten auf dem Seitendach mit einem grossen Querfleck. Brust hinten mit einem schwarzen Fleck jederseits, zuweilen auch in der Mitte schwarz. Schenkel in der Mitte, Schienen an der Spitze, Tarsen oben schwärzlich. Die Färbung der Fühler ist nicht beständig; immer ist das letzte Glied mit Ausnahme seiner Spitze schwarz, meist auch das vorletzte, selten auch das achte und neunte Glied; sie sind beim Männchen viel länger als beim Weibchen; die einzelnen Glieder vom vierten an dreimal so lang als dick, das elfte doppelt so lang als das vorhergehende; beim Weibchen nur doppelt so lang als dick, das elfte um die Hälfte länger als das zehnte. Halsschild mit ziemlich tiefem, dreieckigem Eindruck vor dem Basallappen. Flügeldecken im Basaldreieck schwach eingedrückt, ziemlich dicht und grob, hinten wenig feiner, in den grossen und tiefen Grübchen noch gröber punktiert, mit besonders neben den Grübchen starken Rippen, von denen sich die beiden inneren hinten an der Stelle undeutlich treffen, wo sonst die Makel 4 steht. Seitendach fast so breit als die Hälfte einer Flügeldecke, beim Männchen breiter und mehr flach ausgebreitet als beim Weibchen, aussen meist dick gerandet, wesentlich breiter als bei den folgenden zwei Arten. Der Penis ist spatelförmig, zuerst sehr wenig verbreitert, hierauf sanft ausgerandet, dann kurz zugespitzt, hier nochmals sehr schwach ausgerandet, das Ende stumpf zugespitzt. Männchen, 16.5 × 15 Millimeter; Weibchen, 16.5 × 13.5. Nur das letzte Sternit ist beim Weibchen runzelig mit drei tieferen Eindrücken; beim Männchen ist es glatt, mit seichteren Eindrücken.

Im südlichen China weit verbreitet. Hongkong, Shanghai (? *Boheman*), Yunnan, Fukien, Tonking: Mount Mauson.

Prioptera bisignata Boheman. Tafel 1, Fig. 12.

Prioptera bisignata BOHEMAN, Mon. Cassid. 4 (1862) 22; WEISE, Archiv f. Naturg. 78 (1912) 96.

Bei der Nominatform sind die Flügeldecken wie bei *chinensis* gezeichnet, also nur hinten auf dem Seitendach mit einer schwarzen Quermakel, bei der subsp. *pallida* Wagener[6] fehlt diese Makel. Der Scheitel ist beim Männchen bis zu den Augen oder nur hinten schwarz, beim Weibchen gelb; Brust, Hinterleib, und Beine sind immer (besonders bei *pallida*) minder schwarz gefleckt. Die Fühler sind mit Ausnahme der ersten drei bis fünf Glieder meist schwarz, selten bis auf die zwei letzten Glieder gelb; sie sind beim Männchen um die Hälfte länger als beim Weibchen, alle Endglieder gestreckter, das letzte beim Männchen fast doppelt so lang, beim Weibchen kaum um die Hälfte länger als das zehnte.

Viel kleiner und schmäler als *chinensis*, mit sexuell weniger differierendem Körperbau; der Halsschild ist mehr als doppelt so breit als lang, mit fast erloschenem Grübchen vor dem Basallappen; die Scheibe der Flügeldecken ist im Basaldreieck kaum eingedrückt, bis zur Spitze überall gleichmässig, feiner als bei *chinensis*, fein eingestochen, ziemlich dicht punktiert; die Rippen sind zwar immer erkennbar, oft aber nur durch die begleitenden Punktstreifen markiert, selten schwach herausgehoben, immer schwächer als bei *chinensis;* die Grübchen sind seicht, schwächer als bei dieser Art. Das Seitendach ist wesentlich schmäler als die Hälfte einer Flügeldecke, glatt, viel schmäler als bei *chinensis*, beim Männchen flacher ausgebreitet und breiter als beim Weibchen.

Sehr auffällig ist die Bildung des Penis, die von jener aller anderen Arten ganz verschieden ist; die gelbe, schwarz gezeichnete Röhre ist erst kurz vor der Spitze in eine fast quadratische, zur Spitze hin schwach verengte Fläche mit ziemlich scharf gewinkelten Ecken erweitert, dann ausgerandet und in eine ziemlich lange, am Ende abgerundete Spitze ausgezogen; 12 × 9.5 bis 13.5 × 11 Millimeter.

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[6] Mitt. Münch. Ent. Ver. 5 (1881) 25.

Prioptera bisignata ist in Ost China südlich bis Hongkong verbreitet; nördlich scheint sie bis in die Nähe von Peking zu gehen; in Tsingtau wurde sie mehrfach, besonders zahlreich von Professor Hoffmann (Deutsches Entomologisches Museum) gesammelt; sie kommt daher unbestritten in der palaearktischen Region vor. Die subsp. *pallida* Wagener hat ihr Verbreitungsgebiet südlicher; ich besitze sie aus Yunnan. In Malacca, woher sie Wagener beschreibt, kommt sie gewiss nicht vôr; übrigens trägt der Typus Wagener's in meiner Sammlung die natürlich ebenso falsche Vaterlandsangabe "Malaisie."

Prioptera angusta Spaeth. Tafel 2, Fig. 1.

Prioptera angusta SPAETH, Suppl. Ent. Berlin 3 (1914) 17.

Der vorigen im Körperbau nahestehend, schmäler gebaut, viel schlanker und gestreckter, mehr quergewölbt, mit schmälerem Seitendach, das Weibchen hinten mehr zugespitzt; fast gleich gezeichnet, die Seitendachmakel stets klein, zuweilen fast erloschen; die Brust hinten quer schwarz gefleckt, mitunter einfarbig gelb; das sechste oder siebente bis neunte Fühlerglied bis auf einem hellen Spitzenring gebräunt, das zehnte und elfte pechschwarz.

Der Halsschild ist schmäler als bei *bisignata,* kaum doppelt so breit als lang, die Punktierung der Flügeldecken gröber, das Basaldreieck stärker eingedrückt; die Rippen sind mässig hoch, kräftiger als bei *bisignata,* die Grübchen tiefer, das Seitendach schmäler. Der Penis ist ganz verschieden; dünn, kaum erweitert, ohne Winkel, dann ausgerandet im Bogen verengt und in eine lange, sich stark verjüngende, aufgebogene Spitze ausgezogen. Grösse, 11 × 8.5 Millimeter.

Formosa, von Sauter gesammelt.

Typen im Deutschen Entomologischen Museum und in Coll. Spaeth.

B. Flügeldecken verworren punktiert; Fühler des Männchens unbedeutend länger als die des Weibchens

Prioptera whitei Boheman.

Prioptera whitei BOHEMAN, Cat. Col. Brit. Mus. 9 (1856) 11; Mon. Cassid. 4 (1862) 26.

Verkehrt-eiförmig, nach hinten stark verbreitert, wenig gewölbt, in der Körperform der beiden Geschlechter kaum verschieden. Gelb, die zwei letzten Fühlerglieder schwarz, die Brust oft mit einer schwarzen Querbinde, die Flügeldecken auf der Scheibe jederseits mit einer schwarzen, an der Basis beginnenden, und bis nahe zur Spitze reichenden schwarzen Binde, die aussen vorne fast den Randstreif berührt, nach der Mitte aber einen breiteren Saum freilässt, während die Naht zwischen den beiden Binden vorne viel breiter als hinten hell bleibt; auf dem Seitendache hinter der Mitte eine schwarze, isolierte Quermakel; bei der Nominatform auf dem Halsschild zwei dunkle, oft nur pechbraune verschwommene runde oder schräg gestellte eiförmige Flecke; bei der (häufigeren) ab. *trabeata* Fairmaire[7] fehlen diese Flecke.

Halsschild mit tiefem, dreieckigem Eindruck auf dem Basallappen; Flügeldecken fein, ganz verworren, ohne Rippenansätze punktiert; in den Grübchen etwas, an der Naht bedeutend kräftiger punktiert. Die Fühler des Männchens sind nur wenig länger als die des Weibchens; das Endglied bei ersterem kaum um die Hälfte länger als das zehnte.

Der Penis ist schmal, langsam erweitert, dann etwas schneller verengt, mässig tief ausgebuchtet, schliesslich in eine ziemlich lange Spitze verengt, am Ende kurz abgestutzt. Grösse, 9 × 8 bis 10 × 9 Millimeter.

Central China: Ho-Chan (*R. P. Mouton*), Kyenhaugli, Kuatim.

Prioptera bakeri sp. nov.

Obovata, convexa, valde nitida, rufo-testacea, antennarum articulo ultimo nigro, basibus prothoracis et elytrorum nigro-crenulatis, elytris maculis duabus communibus, magna pone scutellum, minima in apice, deinde 4 utrinque, nempe prima punctiformi in callo humerali, interdum deficiente, secunda subrotundata pone callum, tertia magna transversa in protecto pone medium in discum exeunte, quarta prope suturam hace opposita, nigris, parum cyanescentibus; prothorax lateribus antice rotundatis, postice pectis, disco laevi, in lobo non foveolato; elytris lateribus ad basin haud emarginatis, tum ultra medium valde ampliatis, apice late rotundato, disco convexo, nec gibboso, subtilissime vage punctulatis, utrinque trifoveolato, foveolis punctis sparsis profundioribus; protectum laeve, latum, parum declive. 10 × 9 mm.

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[7] Ann. Soc. Ent. Belg. 32 (1888) 46.

Mindanao, Dapitan et Surigao (No. 11894 dom. Ch. F. Baker).

Höher als *latissima* gewölbt, ohne Andeutung eines Höckers, sehr stark glänzend, verkehrt-eiförmig mit der grössten Breite weit hinter der Mitte der Flügeldecken, gelb oder rötlich gelb, das letzte Fühlerglied schwarz, ebenso die Basalsäume des Halsschildes und der Flügeldecken; letztere mit zehn schwarzen, zum Teil blaumetallisch schimmernden Flecken, davon zwei gemeinsam und zuweilen ein grosser, runder, etwas ungestalteter auf der Höckerstelle, ein kleiner, nur auf den beiderseitigen Nahtsaum beschränkter, länglicher, an der Nahtspitze, ferner vier auf jeder Flügeldecke, der erste punktförmig auf der Schulterbeule, zuweilen fehlend, der zweite hinter ihm, am Randstreif, eiförmig oder rundlich, der dritte gross, quer, hinter der breitesten Stelle der Decken auf dem Seitendache, fast mit der Hälfte in die Scheibe hineinreichend, der vierte neben ihm, näher der Naht. Von diesen vier Flecken entsprechen in der Stellung 2, 3, und 4 den Flecken 1, 3, und 4 der meisten Arten, zum Beispiel, *octopunctata.*

Halsschild doppelt so breit als lang, schmäler und länger als bei *latissima;* die Seiten sind von der Basis und den rechtwinkligen, scharfen Hinterecken bis über die Mitte gerade, parallel, dann sehr stark gerundet; der Vorderrand ist tief ausgerandet mit verrundeten Vorderecken; die Längseindrücke, welche die Scheibe vom Vordache an den Seiten trennen, sind tief, aber vor der Basis abgekürzt; die Scheibe ist spiegelglatt, mit einem seichten Längseindruck vorne, ohne Grübchen auf dem Basallappen. Die Flügeldecken sind an der Basis kaum breiter als der Halsschild, haben rechtwinklige Schulterecken, bis über die Mitte bogenförmig erweiterte Seiten und eine breit verrundete Spitze; die hoch und gleichmässig gewölbte Scheibe ist mikroskopisch fein, verworren punktiert; die Grübchen tief, besonders das Hauptgrübchen, mit vereinzelten tiefen Punkten. Seitendach in der Mitte sehr breit, fast flach ausgebreitet, glatt, stark glänzend.

Von dieser schönen Art habe ich von Herrn Ch. F. Baker zwei Weibchen erhalten; ich gestatte mir, sie ihm als Zeichen meiner Verehrung und Dankbarkeit zu widmen.

Prioptera latissima Wagener. Tafel 2, Fig. 3.

Prioptera latissima WAGENER, Mitt. Münch. Ent. Ver. 5 (1881) 26.

Kenntlich an dem sehr breit gerundeten Körper, insbesonders dem auffällig breiten, beim Männchen flach abgesetzten, vor und nach der Seitendachbrücke innen flach eingedrücktem, aussen aufgebogenem Seitendache, dessen Aussenrand hinter den Schulterecken sehr schwach konvex verläuft. Der Halsschild ist mehr als doppelt so breit als lang, vorne nur mässig tief ausgerandet, mit rechtwinkligen Hinterecken und bis über die Mitte senkrecht zur Basis parallel verlaufenden Seiten; Basalgrübchen fehlt normal, zuweilen aber schwach angedeutet. Flügeldecken im Basaldreieck nicht eingedrückt, mit sehr feiner, eingestochener, von kleinen, dunklen Ringen umgebener Punktierung; von den drei Grübchen jeder Decke sind besonders die äusseren ziemlich tief, alle haben zerstreute grobe Punkte. Von der Zeichnung der Flügeldecken erwähnt Wagener nur die kleine punktförmige Makel hinter der Mitte des Seitendaches; ausserdem sind aber meist noch je zwei kleine dunkle Punktflecke erkennbar, und zuweilen einer innen schräg vor der Hauptgrube (nie in ihr!), der zweite auf dem drittletzten Zwischenraum in der Längsmitte; auch der in meiner Sammlung befindliche Cotypus Wagener's hat den ersteren Fleck angedeutet. Die Rippen sind nur schwach aus den sie begleitenden Punktreihen erkennbar, nicht herausgehoben. An den Fühlern ist die Spitze des letzten Gliedes schwarz. Die Unterseite ist normal gelb, bei einem Stücke von Imugan trägt aber die Hinterbrust hinten eine schwarze Querbinde.

Der Penis ist bis vor die Spitze erweitert, und zuweilen mehr als bei *sospes* und *immaculata,* dann rasch in starkem Bogen zugerundet und in eine kurze, sehr scharfe Spitze ausgezogen, die aber nicht wie die bei den eben erwähnten Arten nach vorne aufgebogen ist, der Abschluss des Penis ist bei *latissima* annähernd kreisrund, bei den anderen Arten elliptisch. Männchen, 10.5 × 9.5 Millimeter. Das Weibchen ist mir unbekannt.

Luzon, Nueva Vizcaya, Imugan (*Baker*).

Prioptera sospes sp. nov. Tafel 2, Fig. 4.

♂, subrotundata, ♀, rotundato-subovata, parum convexa, nitida, flavo-testacea, basibus prothoracis elytrorumque tantum nigro-crenulatis, elytris maculis duabus utrinque punctiformibus, prima in foveola principali, altera subeffusa propius ad suturam pone medium, lateribus post humeros subrectis, haud convexis nec emarginatis, basi haud impressa, disco subtilissime punctulato, utrinque trifoveolato, protecto modice lato.

♂ : 10 × 8.5; ♀ : 11 × 9 mm.

Mindanao, Davao (11885); Zamboanga (8157); Dapitan (17026) dom. C. F. Baker coll.

Bräunlich gelb, die Basalränder des Halsschildes und der Flügeldecken schwarz krenuliert, jede Flügeldecke mit zwei schwärzlichen Punktflecken, der eine klein, in den Hauptgrübchen, dieses ganz ausfüllend aber seine Ränder nicht überschreitend, der zweite hinter der Mitte, näher der Naht, wischförmig. Halsschild vorne tief ausgeschnitten, ohne Basalgrübchen, mit rechtwinkligen Hinterecken und vom ersten Viertel vor der Basis konvergierenden Seiten. Die Flügeldecken mit stumpfwinkligen Schulterecken und dahinter in gerader Linie erweiterten Seiten, im Basaldreieck nicht eingedrückt, mit sehr feinen, dichten, eingestochenen, auch in den Grübchen nur wenig kräftigeren Punkten. Das Seitendach glatt, am Rande nicht aufgebogen, vor und nach der Seitendachbrücke innen mit einem flachen Eindruck, beim Männchen breiter und weniger geneigt als beim Weibchen. Die Spitze der Epipleuren beim Männchen lang abstehend behaart.

Von *latissima* durch gelbes letztes Fühlerglied, nach vorne rascher verengten, an der Spitze tiefer ausgeschnittenen Halsschild, schmäleres Seitendach, die Stellung des vorderen Punktflecks in dem Hauptgrübchen, feiner punktierte Grübchen der Flügeldecken, und die ganz andere Penisform verschieden. Dieser ist dünn, sanft und geradlinig erweitert, dann rascher als bei der Erweiterung verengt, und nach einer kaum deutlichen Ausrandung in ein breit abgestutztes, nach vorne stark aufgebogenes Zäpfchen auslaufend. Diese Form ist viel ähnlicher jener von *immaculata* und *octopustulata* als von *latissima*, unterscheidet sich aber von diesen zwei Arten dadurch, dass das Zäpfchen stärker aufgebogen ist. Im Uebrigen ist *P. sospes* von *immaculata* und *octopustulata* durch Grösse und Breite, breiteres Seitendach, geradlinig hinter den Schulterecken erweiterte Flügeldecken, und dichtere Punktierung der letzteren verschieden.

Prioptera immaculata Wagener.

Den beiden vorigen Arten sehr ähnlich, kleiner und schmäler, mit weniger breitem, am Aussenrande sehr schwach aufgebogenem, aber nicht gerandetem Seitendach, und hinter den Schulterecken schwach ausgerandeten, höchstens geradlinigen Seiten der Flügeldecken. Die Punktierung der Flügeldecken ist mikroskopisch fein, meist nur an den umgebenden Ringen erkennbar; Rippen fehlen und sind höchstens durch die begleitenden feinen Punktreihen erkennbar; die Grübchen sind seicht; Halsschild wie bei *sospes*.

Einschliesslich der Fühlerspitze braungelb; bei der Nominatform fehlen überhaupt andersfarbige Merkmale ausser der dunklen Krenulierung; bei der ab. *fuscopunctata* Weise [8] steht in der Hauptgrube ein dunkler Punkt. Weise's bei dieser Gelegenheit ausgesprochener Zweifel, ob nicht *immaculata* Wagener auf ungefleckte Stücke von *sinuata* zu beziehen sei, ist nicht begründet. Ich besitze zwei Typen Wagener's.

Der Männchen Cotypus ist zweifellos identisch mit jener Art, die schon bisher als *immaculata* Wagener betrachtet wurde und der auch die ab. *fuscopunctata* Weise zugehört; dieses Männchen trägt die Bezeichnung "Philipp." ist also ohne Inselbezeichnung. Der Weibchen Cotypus stammt von Bohol, und ist nicht vollständig ausgereift, daher ganz gelblichweiss, nur mit Andeutung eines dunklen Fleckes in der Hauptgrube. Obwohl das betreffende Stück gegenüber den von Mindanao stammenden Weibchen gedrungener, schmäler, und gewölbter ist, mit im vorderen Teile der Flügeldecken etwas heraustretenden Rippen, und schmäleren, zur Mitte weniger erweiterten Seitendach, möchte ich, insolange mir nicht von Bohol anderweitiges, in gleicher Weise abänderndes Material vorliegt, doch nur individuelle Verschiedenheiten hierin sehen.

Der Penis von *immaculata* ist dünn, anfangs röhren-, dann schwach löffelförmig, vor dem Ende sehr wenig verbreitert, dann schnell mit schwacher Ausrandung verengt, am Ende schmal abgestutzt, dieses Zäpfchen schwach aufgebogen; der Penis des Männchens von *fuscopunctata* aus Basilan ist vollständig gleich gebildet. Grösse, 9 × 7.5 bis 8 Millimeter.

Prioptera immaculata scheint über die ganze Inselgruppe der Philippinen verbreitet zu sein, am häufigsten jedoch auf Mindanao sich zu finden, wo sie auch Baker bei Davao (8156), Butuan (17023 und 17030) und Surigao (16233), sammelte. Von Luzon ist bisher nur die ab. *fuscopunctata* bekannt, woher sie Weise beschreibt; ich besitze diese von Basilan aus der Ausbeute Doherty's.

Prioptera subopaca sp. nov. Tafel 2, Fig. 6.

♂, rotundato-obovata, ♀, fere oblongo-ovata, modice convexa, rufo-testacea, elytrorum disco parum saturatiore, basibus prothoracis elytrorumque nigro-crenulatis; prothorax et protectum nitida, discus elytrorum subopacus, distinctius et parum profundius punctulatus, lateribus pone humeros distincte emarginatis.

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[8] Philip. Journ. Sci. § D 5 (1910) 228.

♂ : 9.5 × 8 – 10 × 8.75; ♀ : 10.5 × 8 mm.

Mindanao, Surigao (16032–34, 17027, et 1703) Butuan (17029) a dom Ch. F. Baker detecta.

Der *P. immaculata* äusserst ähnlich, von der gleichen Grösse, Färbung, und Zeichnung.

Das Männchen hat die gleiche Körperform wie bei *immaculata,* die Flügeldecken sind an den Seiten hinter den Schulterecken deutlich, tiefer als dieser, ausgerandet erweitert, hinter der Mitte am breitesten, dann breit verrundet; das Weibchen ist auffällig schlank, nach hinten kaum erweitert, aber ebenfalls hinter den Schultern ausgerandet. Die Flügeldecken sind auf der Scheibe gesättigter rötlich gelb, matt, wesentlich gröber, tiefer, und dichter, aber immer noch fein punktiert; Halsschild und Seitendach sind dagegen glänzend und glatt; die Grübchen der Flügeldecken sind sehr seicht, etwas gröber als die Scheibe punktiert.

Ganz verschieden ist die Bildung des Penis, er ist breiter, lanzettförmig, in eine nicht aufgebogene, auch nicht abgestutzte Spitze ausgezogen, ohne Zäpfchen.

Das Weibchen ist ausser an der schlanken Körperform, an dem schmäleren, mehr geneigten Seitendache erkennbar; das letzte Fühlerglied ist kaum kürzer als beim Männchen.

Ich verdanke der Liebenswürdigkeit des Herrn Professor Ch. F. Baker 4 Männchen und 3 Weibchen von den angegebenen Fundorten.

Prioptera octopustulata Boheman. Tafel 2, Fig. 5.

Prioptera octopustulata BOHEMAN, Cat. Col. Brit. Mus. **9** (1856) 10; Mon. Cassid. 4 (1862) 24.

In der Körperbildung der *P. immaculata* fast gleich, nur etwas gestreckter und das Basaldreieck eine Spur tiefer eingedrückt; gelb, die Basalränder des Halsschildes und der Flügeldecken fein schwarz krenuliert; auf jeder Decke vier kleine schwarze Flecke in der gewöhnlichen Anordnung; der erste halb verloschen, hinter der Schulter, der zweite in dem Hauptgrübchen, der dritte mehr auf der Scheibe als auf dem Seitendache, verhältnismässig sehr klein, der vierte wischartig, gestreckt hinter der Mitte, nahe der Naht. Die Fühler einfarbig gelb. Die Seiten der Flügeldecken vorne sehr seicht ausgerandet, die Schulterecken fast rechtwinklig. Die Punktierung der Scheibe dicht, aber sehr verloschen, ohne Vertiefung, nur in den beiden äusseren Grübchen etwas kräftiger. Die Flügeldecken glänzen mehr als bei *immaculata;* die Rippen sind selbst vorne wenig bemerkbar, weiter nur durch die hellere Linie zu erkennen. Das Seitendach zeigt die gleiche sexuelle Verschiedenheit und ist ebenso breit wie bei *immaculata.* Der Penis ist sehr ähnlich, aber etwas verbreitert, dann mit schwächerer Ausbuchtung verengt, das Zäpfchen kürzer, breiter abgestutzt, im Profil ebenso vorgezogen. Grösse, 8.75 × 7.75 Millimeter.

Mindanao; Bukidnon, Tangculan (*Baker*), Männchen, Weibchen (unter 16235 eingesandt). Philippinen (*Boheman*).

Prioptera trux sp. nov. Tafel 2, Fig. 14.

♂, ovato-rotundata, ♀, rotundato-ovato, magis convexa, nitida, rufo-testacea, elytris vitta lata basali communi plagaque postica utrinque magna nigris, hac in protectum exeunte; prothorax apice modice emarginato, lateribus posticis subrectis, lobo basali non foveolato; elytra basi haud retusa, lateribus parum (♂) vel perparum (♀) ampliatis, apice plus (♂) minusve (♀) rotundato, disco utrinque sat profunde trifoveolato, mediocriter vage punctato, punctis apice evanescentibus; protectum minus latum, subdeplanatum (♂) vel subdeclive (♀).

♂ : 9.5 × 8; ♀ : 10 × 8 mm.

Insulae Moluccae, Ternate, Batchian (Wallace in Mus. Brit. et coll. Spaeth); Morty (Morotai) Amboina, Gebeh (Mus. Brit. et Mus. Leiden).

Infolge der höheren Wölbung von stark gedrungenem Körperbau; lebhaft glänzend, rötlich gelb, mit schwarzen Basalsäumen des Halsschildes und der Flügeldecken; auf den letzteren wird die ganze Basis von der einen Schulterbeule zur anderen oder selbst bis zum Randstreif von einer breiten, schwarzen Binde eingenommen, die vorne durch das rötliche Schildchen ausgerandet ist und aussen nicht auf die Basis des Seitendaches hinaustritt; ihre rückwärtige Begrenzungslinie ist hinter der Schulterbeule und an der Naht eingebuchtet, beziehungsweise neben dem Randstreif und in die Hauptgrube vorgezogen; vor der Spitze jeder Decke ist ein grosser, schwarzer Fleck, der meist wenig auf das Seitendach übergreift. Fühler, Kopf, und Unterseite sind in beiden Geschlechtern gelbrot.

Der Halsschild ist vorne nur seicht, weniger als bei den drei folgenden verwandten Arten, ausgerandet, mit vorne stark gerundeten, hinten geraden Seiten und rechtwinkligen Hinterecken; die Scheibe ist mikroskopisch fein punktuliert, ohne

Eindruck vor dem Basallappen. Die Flügeldecken sind an den Seiten nach einer sehr schwachen Ausrandung bogig mehr (Männchen) oder weniger (Weibchen) gerundet erweitert, hinten breiter (Männchen) oder weniger breit (Weibchen) abgerundet, oben stark gewölbt, ohne Höcker, im Basaldreieck kaum eingedrückt; die Punktierung ist verworren, nicht dicht, auf dem hellen Mittelbande ziemlich grob, hinten und in den Makeln feiner; die drei Grübchen jederseits sind ziemlich tief, gröber punktiert. Das Seitendach ist glatt, beim Männchen fast flach ausgebreitet, beim Weibchen viel mehr geneigt und schmäler. Die Fühler des Männchens sind nur unwesentlich länger als die des Weibchens. Von den drei folgenden nächst verwandten Arten durch höher gewölbten, mehr gedrungenen, und viel schmäleren Körper, schmäleres Seitendach, seichtere Kopfausrandung, kürzere Fühler, und Zeichnung verschieden.

Der Penis ist löffelförmig, schwach erweitert, dann kurz verengt, mit scharfer, an den Seiten nicht ausgerandeter Spitze, dem von *ceramensis* fast gleich.

Prioptera ceramensis sp. nov.

♂ : Obovata, parum convexa, prothorace nitido, elytris minus nitidis, rufo-testacea, antennis basi excepta, vertice, plagisque utrinque duabus magnis elytrorum nigris; elytra lateribus leviter emarginato-rotundatis, apice subacuminato, disco non gibboso, mediocriter vage punctato, utrinque leviter trifoveolato; protectum laeve, nitidum, subdeplanatum, 11 × 9 mm. Nord Ceram: Wahaai (exp. Martin, IV, 1892) ♀ : latet.

Der *P. amboinica* und *octonotata* nahe verwandt, flacher, nach vorne mehr verengt, hinten stärker zugespitzt, von beiden durch gröbere, schwach runzelige Punktierung der Flügeldecken, hinter der Basis schwach ausgerandete Seiten und andere Zeichnung; von *amboinica* auch durch schwarzen Scheitel des Männchens, und dunkle Fühler verschieden.

Ober- und Unterseite rötlichgelb, die Fühler mit Ausnahme der Basis und des Scheitels schwarz; ebenso die Kerbzähne der Basis von Halsschild und Flügeldecken; auf den letzteren je zwei grosse, schwarze, offenbar aus zweien zusammengeflossene Flecke; der vordere, quer, nimmt mit Ausnahme eines breiten Nahtsaumes die ganze Basis ein und setzt sich schmal in die Basis des Seitendaches fort, dann wird er aussen vom Randstreif begrenzt, während er hinten bis in die Hauptgrube geht; die Schulterbeule ist auch aussen schwarz; die rückwärtige Makel ist quer, vom Aussenrande bis zur Naht. Halsschild schmäler wie bei *amboinica,* mit tiefer Kopfausrandung, vorne stark gerundeten, rückwärts fast parallelen Seiten, recht- oder schwach spitzwinkligen Hinterecken, breit abgesetzten Seitenteilen, ohne oder mit seichtem Grübchen auf dem Basallappen. Flügeldecken um die Hälfte länger als an der Basis breit, mit zuerst seicht ausgerandeten, dann bogig erweiterten Seiten, hinten schwach spitzig (beim Männchen!) ausgezogenem Ende und hier dicht behaarten Epipleuren; die Scheibe ist gewölbt, mit kaum eingedrücktem Basaldreieck; infolge der gröberen, ziemlich zerstreuten Punktierung, in der anfangs zwei Längsrippen schwach erkennbar sind, weniger glänzend; Grübchen seicht, stärker punktiert. Seitendach glatt, glänzender als die Scheibe. Penis schmal, löffelförmig, gerade erweitert, dann in eine kurze, lanzettförmige Spitze ausgezogen, breiter erweitert und kürzer zugespitzt als bei *octonotata,* kürzer und ohne seitliche Ausrandung zugespitzt als bei *amboinica.*

Zwei Männchen in meiner Sammlung.

Prioptera amboinica sp. nov.

♂, subquadrata, ♀, obovato-rotundata, modice convexa, sat nitida, flava vel rufa, antennarum articulo ultimo summo apice, plaga basali fasciaque transversa postica elytrorum nigris; prothorax lateribus late explanatis, angulis posticis subrectis; elytra non gibbosa, lateribus modice ampliatis, disco utrinque leviter trifoveolato, subtiliter punctulato.

♂ : 10 × 8.5 – 10.5 × 9.75; ♀ : 11 × 9 mm.

Amboina (coll. Spaeth, Mus. Budap., Leiden). Ocliasers Ins.: Saporoea (exped. Martin, I, 1892, coll. Spaeth).

Männchen breit-gerundet, fast quadratisch, hinten breit verrundet, Weibchen wenig schmäler, gestreckter, nach vorne mehr verengt, an der Spitze schwach abgestutzt, mässig gewölbt, ziemlich glänzend, lebhaft gelb oder rostrot, nur die äusserste Fühlerspitze meist dunkel, zuweilen zwei punktförmige Wische auf dem Scheitel, der im übrigen auch (im Gegensatz zu *octonotata*) beim Männchen hell ist, die Basalsäume des Halsschildes und der Flügeldecken, dann vorne ein Fleck, hinten eine Binde auf jeder Flügeldecke schwarz; der Fleck ist gross, bis an die Basis ausgedehnt, innen von der Naht durch einen breiten Saum getrennt, aussen durch die Schulterbeule ausgerandet, hinten wenig über das äussere Grübchen hinausreichend, daher vom Randstreif weit entfernt; die Querbinde hinter der Mitte ist aus zwei Flecken zusammengeflossen, daher in der

Mitte oft beiderseits leicht ausgebuchtet; sie erreicht weder innen die Naht noch aussen den Seitenrand; zuweilen ist sie in die ursprünglichen Flecke aufgelöst oder der äussere von diesen erloschen. Halsschild tief ausgeschnitten, mit vorne stark gerundeten Seiten und rechtwinkligen Hinterecken, äusserst fein punktulierter, stark glänzender Scheibe, ohne Eindruck auf dem Lappen. Flügeldecken sehr breit, beim Männchen kaum länger als breit, in der Mitte fast gerade, oder selbst äusserst schwach ausgerandet, wenig erweitert, beim Weibchen gestreckter, von der Basis bis nach der Mitte erweitert, dann kurz verrundet, kaum zugespitzt, die Epipleuren in beiden Geschlechtern hinten abstehend fein behaart; die Scheibe gleichmässig gewölbt, ohne Höcker und auch im Basaldreieck kaum eingedrückt, unregelmässig, dicht, fein eingestochen punktiert, mit kaum erkennbaren Längsrippen; die Punkte meist durch dunkle Höfe vergrössert; die drei Grübchen sind mässig tief, mit viel gröberen Punkten. Das Seitendach ist bereits an der Basis sehr breit, glatt, beim Männchen wenig, beim Weibchen mehr geneigt.

Von der naheverwandten *octonotata* durch weniger gedrungenen Körperbau, flachere Wölbung, hinter der Schulter weniger gerundete Seiten, die Färbung der Fühler, sowie des Scheitels des Männchens und das anscheinend ständige Fehlen der vorderen Aussenmakel der Flügeldecken verschieden.

Der Penis ist löffelförmig, dem von *octonotata* sehr ähnlich, etwas breiter, kürzer, am Ende schneller und mit schwacher Ausrandung zugespitzt; im Verhältnis zu *trux* und *ceramensis* sind sie bei *amboinica* und *octonotata* länger zugespitzt, vorher deutlicher ausgerandet.

Prioptera octonotata Boheman.

Prioptera octonotata BOHEMAN, Mon. Cassid. 1 (1850) 51.

Es scheint dass Boheman zur Beschreibung nur Männchen vorgelegen sind, da er den Scheitel als schwarz angibt, was tatsächlich nur beim Männchen zutrifft, während er beim Weibchen gelb ist; auch die Fühler sind durchaus nicht immer so dunkel als der Autor sie beschreibt; sie haben im allgemeinen die Neigung schwarz zu werden, wobei der Uebergang allmählig, ohne scharfe Grenze, eintritt; bei hellsten Fühlern sind die Basalglieder gelb, meist mit schwarzem Endsaum, das sechste bis zehnte Glied sind gelblich braun, erst die Spitze des letzten Gliedes ist pechschwarz; öfters aber sind alle Glieder vom vierten an schwarz. Halsschild und Flügeldecken sind gelb mit schwarzkrenulierten Basalrändern, auf den Flügeldecken stehen normal je vier Flecke in der gewöhnlichen Anordnung: der erste unter der Schulterbeule am Rande der Scheibe; der zweite innen, meist langgestreckt, bis nahe zur Basis verlängert; der dritte hinten, zur grösseren Hälfte auf dem Seitendache; der vierte neben der Naht; auch diese schwarzen Flecke haben die Neigung sich auszudehnen; sie bilden zuerst Querbinden, dann verbinden schmale Längslinien innen und aussen die Querbinden, endlich wird die ganze Scheibe mit Ausnahme des Aussenteils der Schulterbeule und der Spitze schwarz, mit einem breiten Auslauf hinter die Mitte des Seitendaches, auch Schenkel und Schienen haben dann oft schwarze Flecke.

Prioptera octonotata ist der *amboinica* sehr ähnlich, kürzer und breiter, mit an den Seiten mehr gerundeten, gleich anfangs in schwachem Bogen stärker erweiterten Flügeldecken, so dass die grösste Breite weiter vorne liegt; das Basaldreieck ist kaum eingedrückt, die Grübchen kaum tiefer, die Rippenansätze etwas deutlicher; vor dem Basallappen des Halsschildes ist ein seichter Quereindruck. Männchen breiter und kürzer, an den Seiten etwas mehr erweitert. Penis schwach löffelförmig, geradlinig erweitert, dann in eine lanzettförmige an den Seiten nicht ausgerandete Spitze ausgezogen. Grösse, 9 × 8 Millimeter.

Prioptera octonotata war bisher nur aus Celebes bekannt, wo sie besonders die berühmten Erforscher dieser Insel, die Brüder Sarasin, bei Lambuia im Südosten in Anzahl und in allen Zeichnungs-Uebergängen sammelten. Neuerdings erhielt ich zur Determination vom Museum in Leyden eine von Rosenberg auf Aru gesammelte *Prioptera,* die ich für *octonotata* anspreche; bei derselben (Männchen) fehlen die vorderen Flecke auf den Flügeldecken, von den rückwärtigen ist jener auf dem Seitendache kaum angedeutet, wie der innere hellbraun; an den Fühlern haben das erste bis fünfte Glied einen schmalen, dunklen Endsaum, die folgenden Glieder sind bräunlich gelb, das letzte schwarz. Das Vorkommen von *P. octonotata* auf Aru ist nicht nur wegen der Verbreitung der Art nach Osten, sondern auch da sie der erste Vertreter der Gattung von den Papua-Inseln ist, sehr bemerkenswert.

Prioptera sulana sp. nov.

♂ : Late rotundata, modice convexa, minus nitida, rufo-testacea, antennarum articulo ultimo apice vertice, elytrorum margine basali maculisque utrinque tribus nigris; prothorax lateribus antice valde convergentibus, angulis posticis subrectis, lobo non foveolato; elytra lateribus sat ampliatis, apice late rotundatis, disco convexo, nec gibboso, sat crebre subtiliter punctato, utrinque leviter trifoveolato; protectum latum, laeve, deplanatum. 7 × 6.5 mm.

Sula Besi (Moluccae) a dom Doherty capta.

Der *sinuata* in der Grösse gleich, aber sonst eigentlich nicht sehr nahe verwandt, durch schwarzen Scheitel, andere Anordnung der Flecken der Flügeldecken, kürzeren, breiteren Umriss, kürzeren, breiteren, vorne mehr zugerundeten Halsschild, weniger gewölbte, stärker erweiterte, hinten breiter verrundete Flügeldecken verschieden. Auf den letzteren sind schwarz: der Basalsaum, eine grosse an der Basis beginnende und bis in die Hauptgrube reichende, aussen die Schulterbeule berührende Makel, eine kleinere, aber in Verhältnis zu *sinuata* noch immer grosse, hinter der Mitte, nahe der Naht, endlich auf dem Seitendache hinten eine quere, vom Aussenrande bis ziemlich weit in die Scheibe reichende. Fühler dünner als bei *sinuata,* über die Halsschildecken wesentlich hinausreichend.

Halsschild mehr als doppelt so breit als lang, vorne ziemlich tief ausgeschnitten, an den Seiten vorne sehr stark zugerundet, hinten noch etwas divergierend, so dass die Hinterecken mehr als rechtwinklig sind; die Scheibe ohne Basalgrube. Die Seiten der Flügeldecken setzen die von den Halsschildseiten gegebene Richtung fort und sind anfangs ganz wenig konkav ausgerandet. Das Basaldreieck ist nicht eingedrückt. Rippen fehlen vollständig. Die Punktierung der gleichmässig gewölbten Scheibe der Flügeldecken ist so stark wie bei *sinuata,* überall gleichmässig stark, nur in den schwarzen Punktflecken feiner, in den Grübchen wenig stärker. Das Seitendach ist an der Basis breiter als bei *sinuata.* Von *joloana* ist sie durch noch kürzer gerundeten Umriss, seichter ausgeschnittenen Halsschild, seichtere Grübchen, und dichtere und stärkere Punktierung verschieden.

Ein Männchen in meiner Sammlung.

Prioptera joloana sp. nov. Tafel 2, Fig. 13.

♂ : Rotundata, modice convexa, sat nitida, rufo-testacea, elytris utrinque macula majore subtransversa in protecto postico maculaque parva pone medium dorsi nigris cyanescentibus; prothorax longitudine plus duplo latior lateribus postice subparallelis, angulis posticis rectis; elytra lateribus sat rotundato-ampliatis, haud gibbosa, basi vix impressa, utrinque leviter trifoveolata, subtiliter vage punctulata, protecto, lato, deplanato, laevi.

8.5 × 7.5 mm. Ins. Jolo. ♀ : latet.

Der *sinuata* sehr nahe verwandt und ähnlich, hell gezeichneten Stücken derselben gleich gefärbt. Der Körper ist mehr gerundet, wesentlich breiter; die Fühler sind dünner und schlanker, reichen weiter über die Halsschildseiten hinaus; ihr letztes, einfarbig gelbes Glied ist mehr zugespitzt. Der Halsschild ist vorne tiefer ausgerandet, dreimal so breit als lang, an den Seiten vorne mehr gerundet. Die Flügeldecken sind bei gleicher Länge wesentlich breiter, daher anscheinend kürzer, an den Seiten mehr, zuerst gerade, dann konvex, aber ohne Andeutung einer Ausbuchtung erweitert, mit der grössten Breite weiter vorne, noch in der Mitte im Basaldreieck äusserst schwach eingedrückt mit tieferen und grösseren Grübchen, welche etwas stärker als die Scheibe, aber schwächer als bei *sinuata* punktiert sind; auch die sonstige Punktierung der Scheibe ist feiner und weniger dicht als bei dieser; an der Basis sind schwache Ansätze zu flachen Rippen, die aussen und innen von der Hauptgrube enden. Das Seitendach ist breiter als bei *sinuata*, glatt, flach ausgebreitet.

Die Zeichnung besteht aus den Makeln 3: auf dem Seitendach, hinter der Mitte, klein, den Aussenrand nicht erreichend, und 4: sehr klein, rund, hinter der Mitte. Der Penis ist röhrenförmig, kaum, noch schwächer als bei *sinuata* erweitert, dann geradlinig, also nicht wie bei *sinuata* im Bogen verengt, viel länger zugespitzt, hiebei sehr seicht ausgerandet und in eine stumpfe Spitze vorgezogen.

Prioptera sinuata Olivier. Tafel 2, Fig. 12.

Cassida sinuata OLIVIER, Enc. Méth. 5 (1790) 392; Ent. 6 (1808) 949; 97, t. V, f. 71; FABRICIUS, Ent. Syst. 1 (1792) 298; Syst. El. 1 (1801) 398; HERBST, Naturs. Käf. 8 (1799) 336.

Prioptera sinuata BOHEMAN, Mon. Cassid. 4 (1862) 25; WEISE, Philip. Journ. Sci. § D 5 (1910) 228.

Prioptera sinuata ab. *decemnotata* BOHEMAN, Mon. Cassid. 1 (1850) 59.

Prioptera sinuata ab. *quadrisignata* BOHEMAN, Mon. Cassid. 1 (1850) 58.

Prioptera deficiens WEISE, Philip. Journ. Sci. § D 5 (1910) 229; 8 (1913) 240.

Prioptera sinuata ab. *binotata* BOHEMAN, Cat. Col. Ins. Brit. Mus. 9 (1856) 10; Mon. Cassid. 4 (1862) 23.

Prioptera sinuata ist dadurch bemerkenswert, dass die Zahl der schwarzen Flecke auf den Flügeldecken normal die gewöhnliche Vierzahl übersteigt, und dass diese Flecke zum Teil eine andere Stellung haben. Von den normalen sechs Flecken sind nur die Makeln 3 und 4 an den sonst gewöhnlichen Stellen hinter der Mitte, auf dem Seitendach, beziehungsweise neben der Naht; die Makel 1 steht auf der Schulterbeule, nicht hinter ihr, und ist rund, nicht länglich; Makel 2 steht schräg innen vor dem Hauptgrübchen, nicht in demselben, dessen Ränder sie nicht berührt; von den zwei weiteren Flecken steht der eine aussen in der Längsmitte hinter 1, der andere auf den Abfall, schon nahe der Spitze, unmittelbar neben der Naht, und ist oft mit seinem Gegenüber zu einer gemeinsamen Makel verbunden. Fehlt letztere Makel, so ergibt sich die ab. *decemnotata;* fehlen auch die übrigen inneren Flecken (2, 5, 4) so liegt die ab. *quadrisignata* Boheman vor, mit welcher *deficiens* Weise im wesentlichen zusammenfällt; endlich scheint die mir unbekannte *binotata* Boheman auf Stücken zu beruhen bei denen auch die Seitendachmakel fehlt, so dass die Schultermakel allein erübrigt. Meist sind die Deckenmakeln klein, selten gross.

Die Fühlerspitze ist bald einfarbig gelb, bald geschwärzt, ohne scharfe mit dem Beginnen eines Gliedes zusammenfallende Grenze; es kann daher hieraus nicht, wie dies Boheman bezüglich *binotata* tut, ein Unterscheidungsmerkmal abgeleitet werden. Die Flügeldecken sind hinter der Basis geradlinig, bei kräftigen Männchen konvex gerundet erweitert, stets beim kürzeren und hinten mehr verbreiterten, an der Spitze breiter verrundeten Männchen mehr als bei dem gestreckteren Weibchen; das Basaldreieck ist gar nicht eingedrückt, die Scheibe dicht und fein in den bald mässig tiefen, bald halb verloschenen Grübchen gröber punktiert, ohne Rippenbildung.

Die Fühler sind, besonders beim Männchen, auffallend kurz und kräftig; sie erreichen beim Weibchen nicht die Hinterecken des Halsschildes, beim Männchen überragen sie sie nur wenig; die Abgrenzung der einzelnen Glieder, von denen, mit Ausnahme des letzten, auch die äusseren beim Weibchen kürzer als dick sind, ist oft nur schwer zu erkennen. Der Penis ist dünn, fast bis zur Spitze sanft erweitert, dann sehr schnell im Bogen zusammenlaufend, daher am Ende fast kreisförmig gerundet, hiebei schwach ausgerandet, mit einem kleinen, scharfen Zahn an der Spitze.

Männchen, 8 × 7.5 Millimeter; Weibchen, 9 × 7.

Von den Philippinen beschrieben; die mir bisher mit verlässlichen Fundort bekannt gewordenen Stücke stammten sämmtlich von Luzon. Baker hat die Art in Anzahl bei Los Baños gesammelt.

Die Jugendstadien wurden von W. Schultze [9] beschrieben und abgebildet; die Art lebt auf *Premna vestita* Schauer.

Prioptera ramigera Boheman.

Prioptera ramigera BOHEMAN, Mon. Cassid. 4 (1862) 25.

Der Autor gibt als Patria dieser Art an: "Sumatra et Borneo (Garantato)." Einen Ort dieses Namens konnte ich in den mir zugänglichen Behelfen weder auf Sumatra noch auf Borneo finden; vielleicht sollte es statt "et" richtiger "aut" heissen, da wie es scheint, der Beschreibung nur ein einzelnes Stück zu Grunde lag. Mit Garantato aber, das vielleicht nur auf einer schlecht lesbaren Etiquette beruht, könnte Gorontalo gemeint sein, das im Süden der den nördlichsten Teil von Celebes bildenden Halbinsel Minahassa im Golf von Tamini oder Gorontalo liegt. Hienach würde die Art aus Celebes stammen und die Beschreibung kann ohne Bedenken auf ein etwas abnorm gezeichnetes Stück von *P. figurata* Weise [10] bezogen werden, bei dem ausser den bindenförmig zusammenfliessenden normalen drei Flecken auf jeder Flügeldecke und der rückwärtigen Seitendachmakel noch die Naht an der Höckerstelle mit einer schwarzen Längsmakel gezeichnet ist; das Vorkommen einer so gezeichneten Form ist umsoweniger von der Hand zu weisen als bei *figurata* die Zeichnung sehr wenig konstant ist.

Männchen und Weibchen sind bei dieser Art sehr wenig verschieden; insbesonders ist das letzte Fühlerglied auch beim Weibchen ziemlich lang, um ein Viertel länger als das zehnte, während es beim Männchen kaum um die Hälfte länger ist; im übrigen ist das Männchen kürzer, etwas breiter, mit der grössten Breite in der Mitte (beim Weibchen hinter der Mitte) der Flügeldecken, hinter den Schultern rascher erweitert und daher hier mit breiterem Seitendach, welches jedoch in seinem weiteren Verlaufe beim Weibchen nicht schmäler und auch nicht stärker geneigt ist als beim Männchen. Rötlichgelb, die zwei letzten Fühlerglieder, mitunter auch nur das letzte, unbestimmt und ohne scharfe Grenze braun, die Basalränder des Halsschildes und der Flügeldecken mit schwarzer Zähnung, die Unterseite einfarbig gelb; auf den Flügeldecken normal die gewöhnlichen vier schwarzen Flecke; von ihnen ist der vordere Innenfleck nicht auf das Hauptgrübchen beschränkt, sondern hat seinen normalen Standpunkt vor demselben, dehnt sich aber bei kräftiger gezeichneten Decken und bei zusammenfliessenden Flecken bis in oder hinter die Hauptgrube aus. Bei dem Männchen meiner Sammlung sind die Flecke 2, 3, und 4 sehr klein, halb verloschen, und 1 fehlt vollständig; meist fliessen diese Flecke zusammen, wobei die Neigung besteht dass die Verbindung der vorderen und rückwärtigen Flecke durch Längsbinden erfolgt, während bei fast allen anderen Arten, mit Ausnahme von *impacata* und *octonotata,* in erster Linie die neben einander liegenden Flecke sich vereinigen. Diese Form hat Weise (l. c.) als *figurata* beschrieben.

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[9] Philip. Journ. Sci. § A 3 (1908) 261, pl. 1, figs. 1–5.

[10] Archiv f. Naturg. 78 (1912) 97.

Halsschild glatt, glänzend, mit wenig verrundeten, meist stumpf gewinkelten Vorder-, recht- oder schwach spitzwinkligen Hinterecken. Flügeldecken im Basaldreieck sehr schwach eingedrückt, mit mässig oder ziemlich groben, an der Naht und aussen stellenweise gereihten, hinten kaum schwächeren Punkten, sehr tiefen Grübchen, und zwei sehr schwachen, kaum herausgehobenen oder nur an den begleitenden Punktreihen erkennbaren Rippen. Penis schmal, sehr schwach und langsam erweitert löffelförmig, am Ende kurz, geradlinig zugespitzt, mit kaum abgestumpfter Spitze. Männchen, 8.5 × 7 Millimeter; Weibchen, 9.5 × 8.

Celebes. Mir liegen aus meiner Sammlung Männchen und Weibchen von Samanga aus Süd Celebes und ein Weibchen mit Celebes (Köhler) ohne näheren Fundort vor.

Prioptera impacata sp. nov. Tafel 2, Fig. 9.

Der vorigen äusserst ähnlich, aber sicher durch andere Penisform verschieden.

Männchen kürzer und breiter, nach hinten mehr verbreitert, daher von mehr gerundetem Umriss; der Scheitel schwarz, die Basalglieder der Fühler am Ende mit dunklem Saume, die Endglieder durchwegs pechbraun. Halsschild mit einer meist die ganze Scheibe bedeckenden und mitunter bis in die Hinterecken reichenden pechbraunen bis pechschwarzen unscharfen, vorne meist beiderseits ausgerandeten Zeichnung. Basalränder schwarz gezähnelt. Schildchen gelb; Flügeldecken normal mit vier Flecken in der gewöhnlichen Anordnung; bei dem einen Männchen sind diese Flecke von einander getrennt, gross, so dass die neben einander stehenden fast zusammenstossen; der zweite nimmt ausser dem Hauptgrübchen noch einen grossen Teil der Basalpartie ein; bei dem zweiten Männchen fliessen die Flecke unbestimmt zusammen, es bleiben nur die Naht bis über die Mitte, die Spitze, und eine unterbrochene Querbinde heller, dunkelrötlich; bei dem dritten Männchen sind die Flügeldecken schwarz, nur auf dem Seitendache die Spitze und ein breiter Aussensaum, bis über die Mitte reichend, gelb. Prosternum, Brust, Schenkel, Schienen, und Oberseite der Tarsen minder schwarz gefleckt.

Das einzige, mir vorliegende Weibchen ist wie jenes von *ramigera* gefärbt, also rötlichgelb (auch der Scheitel), an den Fühlern nur die zwei letzten Glieder gebräunt, auf den Flügeldecken je vier schwarze Flecke, von welchen die vorderen mit den rückwärtigen durch dünne Längslinien verbunden werden. Das Weibchen ist viel länger und schlanker als das Männchen, nach hinten viel weniger erweitert, weit mehr eiförmig.

Halsschild kurz, hinten mehr als doppelt so breit als lang, mit etwas spitzwinkligen Hinterecken, konvergierenden, gerundeten Seiten, ziemlich scharfgewinkelten Vorderecken, und weit und tief ausgeschnittenem Vorderrand. Basallappen ohne Grübchen, Scheibe glatt.

Flügeldecken im Basaldreieck sehr schwach eingedrückt, aber nicht gehöckert, stark nach der Quere gewölbt, ziemlich grob, stellenweise gereiht, hinten feiner punktiert, mit grossen und tiefen, gröber punktierten Grübchen und je glatten Rippen, die durch die begleitenden Punktreihen kräftiger als bei *ramigera* heraustreten. Der Penis ist kaum dicker als bei *ramigera,* ebenfalls löffelförmig, aber zur Mitte langsamer erweitert, länger zugespitzt.

Wie aus der obigen Beschreibung ersichtlich, ist das Männchen überdies durch kürzeren, breiteren, mehr gerundeten Umriss, schwarzen Scheitel, die Färbung der Fühler, ferner ebenso wie das Weibchen durch das tiefere Hauptgrübchen verschieden.

Männchen, 8 × 7 Millimeter; Weibchen, 9.5 × 7.

Ich besitze 3 Männchen und 1 Weibchen aus der Sammlung Baly, wo sie irrtümlich als *octonotata* Boheman determiniert waren; zwei hievon tragen die Fundortbezeichnung Makassar.

Von *P. sinuata* sind *ramigera* und *impacata* durch längere und dünnere Fühler, höhere Querwölbung der Flügeldecken, den Eindruck im Basaldreieck, und tiefere Grübchen verschieden; von der ebenfalls auf Celebes einheimischen *octonotata* unterscheiden sie die geringere Grösse, der höher gewölbte, nach vorne viel mehr verengte Körper, der breitere Ausschnitt des Vorderrandes des Halsschildes und die tieferen Grübchen.

Prioptera decemmaculata Boheman. Tafel 2, Fig. 8.

Prioptera decemmaculata BOHEMAN, Mon. Cassid. 1 (1850) 60; MAULIK, Rec. Ind. Mus. 9 (1913) 109; Fauna Brit. Ind. Cassid. (1919) 314, f. 98.

Gelb bis gelblichrot, die Brust hinten mit einem schwarzen Querfleck, der Scheitel fast immer schwarz, auf dem Halsschilde zwei rundliche Flecke nebeneinander, auf den Flügeldecken je vier schwarze Flecke: der erste länglich, hinter der Schulterbeule, der zweite an der Basis neben der Naht, immer vor dem Hauptgrübchen, der dritte hinter der Mitte des Seitendaches, zur Hälfte auf der Scheibe, der vierte neben ihm, an der Naht.

Halsschild vorne seicht ausgerandet mit glatter Scheibe und einem grossen, aber seichten, dreieckigen Eindruck vor dem Basallappen; die Hinterecken recht- oder schwach spitzwinklig. Flügeldecken gleichmässig gewölbt, ohne Eindruck im Basaldreieck, meist mässig grob, auf den schwarzen Flecken verloschen, hinten etwas feiner punktiert, die Punkte meist ganz verworren, selten stellenweise unregelmässig gereiht; die Grübchen seicht, gröber punktiert. Die Fühler des Männchens kaum länger als beim Weibchen, mit etwas längerem und gegen die Spitze weniger verdicktem letzten Gliede.

Die eigentliche *P. decemmaculata* Boheman, welche vom Himalaya Gebirge beschrieben wurde und in den südlichen Vorbergen dieses Gebirgsstockes und in Assam nicht selten ist, hat einen eiförmigen, nach hinten mässig erweiterten Umriss; an den Fühlern ist stets das letzte Glied schwarz; der Scheitel ist beim Männchen ganz schwarz, beim Weibchen trägt er eine minder ausgedehnte oder geteilte schwarze Makel; die Flecke auf dem Halsschild und den Flügeldecken sind gross und immer vollzählig; das Seitendach ist etwa ein Drittel so breit als eine Decke.

Von dieser Form kann die wahrscheinlich auf Weibchen aufgestellte *P. decemsignata* Boheman[11] aus Assam nicht getrennt werden. Im Museum von Helsingfors ist der aus der Sammlung Mannerheim beschriebene Typus von *decemsignata* nach brieflicher Mitteilung von Professor Salaas nicht mehr vorhanden. In Assam hat P. Cardon bei Barway in Anzahl und ausschliesslich eine Unterform von *decemmaculata* gesammelt, bei welcher ausser der Brust auch das Prosternum und die Schenkelmitte gebräunt sind und die Makel hinter der Schulterbeule sich nach vorne auf das Seitendach bis in dessen

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[11] Mon. Cassid. 1 (1850) 62.

Basalecke verlängert; die Flügeldecken sind bei dieser Form kräftiger punktiert, die Rippen durch die begleitenden Punktreihen schwach angedeutet (m. ab. *cardoni* nov.).

Eine besonders in Ost Sumatra, Liangagas (*Dohrn*), Lanka Deli Bedagei (*Kannegieter*), Tebing-tinggi (*Schultheiss*), Tandjong Morawa Serdang (*Hagen*), Ober Langkat, verbreitete Form (*macularia* subsp. nov.), von welcher mir auch je ein Stück von Perak auf Malacca (*Doherty*) und Jetebu (?) vorliegt, unterscheidet sich von der Nominatform durch flachere Wölbung, die wesentlich breiteren, nach hinten in beiden Geschlechtern viel mehr erweiterte Flügeldecken, breiteres, fast die halbe Breite einer Decke erreichendes Seitendach und grössere Gestalt (9 × 8 bis 10 × 8.5 Millimeter).

Ich war lange geneigt, in dieser Form eine eigene Art zu erblicken, doch ist sowohl die Penisbildung vollständig die gleiche, wie auch besonders unter den von Dr. Hagen gesammelten Stücken aus dem Museum in Leyden sich schwache Uebergangsformen zur Stammart zeigen, die mir die Gewissheit geben, dass nur eine Lokalrasse vorliegt.

Die Typen von *cardoni* und *macularia* sind in meiner Sammlung; Cotypen der letzteren in den Museen von Stettin und Leyden.

Während bei allen früher erwähnten Formen die Färbung der Fühler konstant derart ist, dass nur das letzte Glied scharf abgetrennt schwarz ist, zeigt sie sich bei der in Hinter-Indien vorkommenden, auch sonst sehr abweichenden Lokalform als schwankend; die hieher gehörenden Tiere, die die Subspecies *pallidicornis* Boheman bilden, sind oblong-eiförmig, nach hinten nicht erweitert, mit sehr schmalem, dicker gerandetem Seitendach, und meist tieferer und dichterer Punktierung mit deutlicher herausgehobener Innenrippe.

Die Makeln auf Halsschild und Flügeldecken sind fast immer klein, jene hinter der Schulterbeule fehlt mitunter, während die hinter ihr stehende sich teilen kann. Die Fühler sind entweder ganz gelb (*pallidicornis* Boheman [12] aus Tenasserim beschrieben) oder vom dritten oder sechsten Gliede an braun bis pechschwarz, ohne scharfe Grenze (ab. *nigricornis* Baly,[13] von Laos, Siam, mit welcher *fuscicornis* Weise [14] von Burma, Prome, Paungde, Maulmein, zusammenfällt).

[12] Mon. Cassid. 1 (1850) 61.

[13] Journ. Ent. 2 (1863) 9.

[14] Deutsch. Ent. Zeitschr. (1897) 101.

Bei einem von Helfer in Tenasserim gesammelten Weibchen, das in der Körperform mit der Siam-Rasse ganz übereinstimmt, ist nur das letzte Fühlerglied scharf abgesetzt schwarz. Grösse, 8 × 6 bis 9.5 × 7 Millimeter.

Die Penisform ist bei allen Formen gleich; dünn, erst wenig erweitert, dann kurz verengt, ohne Ausrandung, mit scharfer Spitze.

Prioptera scheerpeltzi sp. nov.

♂, latius, ♀, minus late obovata, convexa, sat nitida, rufotestacea, antennarum apice, plaga transversa pectoris lituraque obsoleta pone medium protecto piceis; prothorax lobo non foveolato, lateribus vix rotundatis; elytra basi haud retusa, sat crebre et profunde, apice vix subtilius, subrugose vage punctata, utrinque trifoveolata.

♂ : 10 × 8, ♀ : 10.5 × 8 mm. coll. Spaeth.

Ins. Soemba (Solemba ?) et Patadalu.

Rötlich gelbbraun, die vier oder fünf letzten Fühlerglieder allmählig in pechbraun übergehend, ohne scharfe Grenze; dieselbe Färbung hat eine schmale Quermakel hinten auf der Brust und eine kleine wischförmige Makel innen auf dem Seitendach hinter der Mitte; bei dem Männchen ist (zufällig) auch der Raum hinter der Schulterbeule leicht gebräunt.

Von verhältnismässig schlanker Gestalt; das Männchen ist breiter und kürzer, hinten mehr verbreitert, an der Spitze schneller verrundet; die grösste Breite liegt bei beiden Geschlechtern hinter der Mitte der Flügeldecken; die Fühler des Männchens sind wenig länger, das Seitendach breiter, weniger geneigt.

Die Seiten des Halsschildes sind hinten gerade, dabei schwach divergierend, so dass die Hinterecken etwas spitzwinklig sind; die Scheibe ist glatt, ohne Grübchen vor dem Schildchen, die Seiten durch eine bis an die Basis reichende Furche breit abgesetzt. Die Flügeldecken sind an den Seiten geradlinig, sehr schwach (Weibchen) oder mässig (Männchen) erweitert, das Basaldreieck ist schwach eingedrückt; die Profillinie fällt hinten geradlinig, vorne steiler ab; eine undeutliche, breite, schwach hinausgewölbte Leiste begrenzt die Seiten des Basaldreiecks und endet vorne in eine glatte Beule; sie erlischt, ebenso wie die äussere, schwächere Rippe schon neben dem Hauptgrübchen. Die Scheibe ist ziemlich dicht, vorne aussen grob runzelig, hinten wenig feiner punktiert; die Punkte sind oft im Grunde dunkler und stehen verworren; in den Grübchen sind die Punkte zerstreuter und gröber; die Hauptgrube ist gross und ziemlich tief. Der Penis ist löffelförmig, langsam aber ziemlich stark erweitert, dann geradlinig zugespitzt und kurz quer abgestutzt. Ich widme diese schöne Art meinem Freunde, Herrn Professor Otto Scheerpeltz in Wien, dem bekannten Staphylinen-Forscher, der die Liebenswürdigkeit hatte die zu dieser Arbeit erforderlichen Zeichnungen in seiner bekannten vorzüglichen Art anzufertigen.

Prioptera timorensis sp. nov.

Ovalis, modice convexa, haud nitida, testacea, antennis articulis duobus primis exceptis nigris, elytris maculis duabus nigris, prima elongata pone callum humeralem, alterna transversa in protecto pone medium, pectore macula nigra transversa, epipleuris macula transversa pone medium; antennae minus elongatae, in mare vix dimidio longiores; prothorax rugulosus, indistincte punctatus, medio canalicula postice abbreviata; elytra breviter pubescentia, sat profunde et dense vage ruguloso-punctata, interstitiis hicillic callose confluentibus, leviter convexa, basi vix retusa, nec gibbosa, utrinque foveolis tribus latis nec profundis, distinctius punctatis; protectum angustum sublaeve, vel (♂) deplanatum et latius, vel (♀) subdeflexum et angustius. 9 × 7 mm.

Timor, Koupang (Mus. Leiden).

Durch die grobe Runzelung des Halsschildes und die Behaarung der Flügeldecken von allen anderen Arten verschieden.

Mässig gewölbt, eiförmig mit der grössten Breite hinter der Mitte der Flügeldecken; bräunlichgelb, die Fühler mit Ausnahme der ersten zwei Glieder und eine Quermakel hinten auf der Brust schwarz; auf den Flügeldecken eine strichförmige schwarze Makel am Rande der Scheibe hinter der Schulterbeule und eine quere, auch unterseits sichtbare bis an den Rand reichende Querbinde hinter der Mitte des Seitendaches.

Halsschild doppelt so breit als lang, vorne weit ausgerandet, mit senkrecht zur Basis verlaufenden Seiten; Scheibe und Vordach sind, erstere gröber, letzteres feiner gerunzelt, ebenso der Mittellappen, die Scheibe mit einer scharf eingeschnittenen, hinten abgekürzten, schmalen Rinne. Flügeldecken an der Basis von der Breite der Halsschildbasis, in beiden Geschlechtern ohne Ausrandung in schwachem Bogen bis über die Mitte erweitert, im Basaldreieck sehr schwach eingedrückt, ohne Höcker aber mit schwach winklig gebrochener Profillinie, mit je einer glatten, glänzenden, verhaltnismässig hohen Beule neben dem Schildchen, grob, tief und ziemlich dicht, überall gleich stark runzelig punktiert und mit kurzen, abstehenden, greisen Härchen besetzt; die Nahtkante glatt und erhaben; die Zwischenräume stellenweise schwielig und darmartig gerunzelt.

Das Seitendach beim Männchen breiter und flacher ausgebreitet als beim Weibchen, viel feiner als die Scheibe gerunzelt, fast glatt; die Epipleuren fein und kurz abstehend behaart.

Die Fühler sind beim Männchen reichlich von der halben Körperlänge, ihr letztes Glied ist um die Hälfte länger als das vorletzte; beim Weibchen sind sie um die Hälfte kürzer, das letzte Glied wenig länger als das zehnte; in beiden Geschlechtern sind sie bis zur Spitze nicht verdickt.

C. Flügeldecken gestreift-punktiert

Prioptera prognata sp. nov.

♀: Obovata, parum convexa, nitida, rufo-testacea, capite, antennarum articulo apicali, plaga transversa pectoris, abdomine medio nigris, vitta pone medium protecti atro-cyanescente; prothorax lateribus postice subrectis, lobo non foveolato; elytra sensim ampliata, apice breviter rotundato, disco non gibboso, obsolete trifoveolato, profunde, subregulariter striato-punctato, interstitiis leviter convexis, alternis intus subelevatis; protectum basi angustum, medio sat latum, parum declive. 8 × 6 mm.

Darjeeling (*Moffarts*).

Von auffallend kleiner Gestalt, durch die tief punktiert-gestreiften Flügeldecken sehr ausgezeichnet; keiner anderen Art ähnlich. Verkehrt-eiförmig, vor der Spitze am breitesten, stark glänzend, wenig gewölbt, braungelb mit gesättigterer Färbung der Scheiben des Halsschildes und der Flügeldecken; der ganze Kopf mit Ausnahme des Mundes (nicht blos wie bei vielen anderen Arten, der Scheitel!), das letzte Fühlerglied, eine breite Querbinde hinten auf der Brust, und kurze Querbinden auf den ersten Sterniten schwarz; auf dem Seitendache hinter der breitesten Stelle eine schwarz-blaue metallische Makel.

Die Fühler sehr kurz, kaum von doppelter Halsschildlänge; die äusseren Glieder nur wenig länger als breit, das letzte um die Hälfte länger. Halsschild doppelt so breit als lang, vorne mässig tief ausgebuchtet, mit breit verrundeten Vorderecken, vorne stärker, dann schwach gerundeten Seiten und fast rechtwinkligen Hinterecken; die Scheibe glatt, mit lebhaftem Glanze, hinten ohne Grübchen, an den Seiten mit vor der Basis erlöschenden Rinnen. Die Flügeldecken sind bis zu ihrer breitesten Stelle ohne Buchtung, geradlinig erweitert, hinten kurz verrundet, gleichmässig aber wenig gewölbt, ohne Eindruck im Basaldreieck; auf jeder Decke zehn grobe, auch vor der Spitze nur wenig schwächere Punktstreifen, davon der erste, zweite, und siebente bis zehnte fast regelmässig, die inneren etwas verworren und runzelig; der zweite, vierte, und sechste Zwischenraum sind etwas breiter und höher; die gröber punktierte Hauptgrube liegt zwischen dem zweiten und vierten, so dass der dritte Zwischenraum in ihr verschwindet; die anderen zwei Grübchen sind viel seichter und liegen zusammenfliessend hinter einander zwischen dem vierten und sechsten Zwischenraum. Das Seitendach ist an der Basis schmal, dann schwach verbreitert, etwas geneigt, glatt.

Ein Weibchen in meiner Sammlung, das ich vor vielen Jahren von Herrn R. Clavareau erhalten hatte.

Genus **PRIOPTERA** Hope

decempustulata Boheman; Hinter-Indien, Sumatra, Java.
decempustulata Boheman ab. **parumguttata** nov.; Malacca.
decempustulata Boheman subsp. **borneensis** nov.; Süd Borneo.
nigricollis Weise; Nias.
sarawacensis Spaeth; Borneo.
vicina sp. nov.; Süd Palawan.
octopunctata Fabricius; Java, Süd Borneo.
octopunctata Fabricius ab. **fumigata** nov.; Java.
octopunctata Fabricius ab. **bipuncticollis** Boheman; Java.
octopunctata Fabricius ab. **picicollis** nov.; Java.
schultzei Weise; Mindoro.
octomaculata Boheman; Java, Sumatra.
gibbosa Baly; Tringanee (Malacca).
atricornis Spaeth; Borneo.
  nigricornis Weise.
gibbifera sp. nov.; Südost Borneo.
sumatrana Weise; Nias, Sumatra (?).
morigera sp. nov.; Palawan, Balabac.
privigna Boheman; Java, Sumatra.
puellaris sp. nov.; Sumatra.
decemstillata Boheman; Darjeeling.
andrewesi Weise; Burma.
maerkeli Boheman; Java.
quadriimpressa Boheman; Java.
palawanica Weise; Palawan.
bimaculata Thunberg; Hinter-Indien.
  bimaculata Thunberg ab. *impustulata* Boheman.

- **rugosipennis** Spaeth; Ost Sumatra.
  - *sexmaculata* Boheman; Hinter-Indien, Tonking.
  - *maculipennis* Boheman; Assam, Burma.
  - *punctipennis* Wagener.
  - *rugosa* Baly.
- **secreta** sp. nov.; Laos.
- **encausta** sp. nov.; Cochinchina.
- **pudica** sp. nov.; Süd China, Yunnan.
- **cerata** sp. nov.; Cochinchina.
- **opima** sp. nov.; Tonking.
- **westermanni** Boheman; Laos, Assam.
- **multiplagiata** Wagener; Andaman.
- **chinensis** Fabricius; Süd China, Yunnan.
  - *satrapa* Boheman.
- **bisignata** Boheman; China bis Shantung.
- **bisignata** Boheman subsp. **pallida** Wagener; Yunnan.
- **angusta** Spaeth; Formosa.
- **whitei** Boheman; Central China.
- **whitei** Boheman ab. **trabeata** Fairmaire.
- **bakeri** sp. nov.; Mindanao.
- **latissima** Wagener; Luzon.
- **sospes** sp. nov.; Mindanao.
- **immaculata** Wagener; Philippinen.
- **immaculata** Wagener ab. **fuscopunctata** Weise; Luzon, Basilan.
- **subopaca** sp. nov.; Mindanao.
- **octopustulata** Boheman; Philippinen, Bukidnon.
- **trux** sp. nov.; Molukken.
- **ceramensis** sp. nov.; Ceram.
- **amboinica** sp. nov.; Amboina, Ocliasers.
- **octonotata** Boheman; Celebes, Aru.
- **sulana** sp. nov.; Sula Besi (Molukken).
- **joloana** sp. nov.; Jolo.
- **sinuata** Olivier; Philippinen.
  - *sinuata* Olivier ab. *decemnotata* Boheman.
  - *sinuata* Olivier ab. *quadrisignata* Boheman.
  - *deficiens* Weise.
  - *deficiens* Weise ab. *binotata* Boheman.
- **ramigera** Boheman; Celebes.
- **ramigera** Boheman ab. **figurata** Weise.
- **impacata** sp. nov.; Celebes.
- **decemmaculata** Boheman; Süd Himalaya, Assam.
- **decemsignata** Boheman.
- **decemsignata** Boheman ab. **cardoni** nov.; Assam.
- **decemsignata** Boheman subsp. **macularia** nov.; Sumatra, Perak.
- **decemsignata** Boheman subsp. **pallidicornis** Boheman; Hinter-Indien.
- **decemsignata** Boheman ab. **nigricornis** Baly; Burma, Laos, Siam.
- **decemsignata** Boheman ab. **fuscicornis** Weise.
- **scheerpeltzi** sp. nov.; Solemba, Patadalu.
- **timorensis** sp. nov.; Timor.
- **prognata** sp. nov.; Darjeeling.

ILLUSTRATIONEN

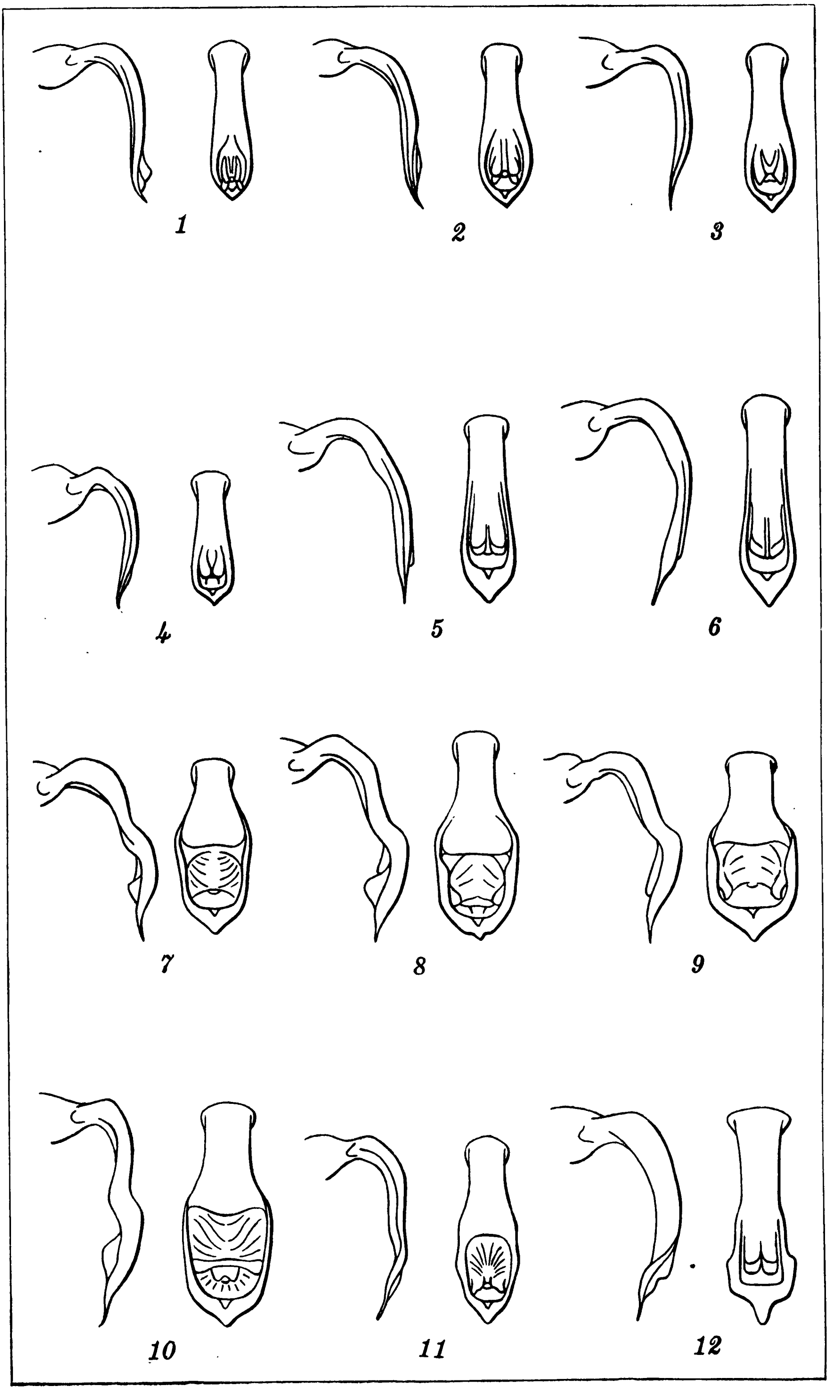
[Forceps in Seitenansicht und in Vorderansicht. Zeichnungen verfasst von Scheerpeltz.]

TAFEL 1

FIG. 1. *Prioptera decempustulata* Boheman.
2. *Prioptera sarawacensis* Spaeth.
3. *Prioptera vicina* sp. nov.
4. *Prioptera octopunctata* Fabricius.
5. *Prioptera pudica* sp. nov.
6. *Prioptera secreta* sp. nov.
7. *Prioptera cerata* sp. nov.
8. *Prioptera encausta* sp. nov.
9. *Prioptera opima* sp. nov.
10. *Prioptera westermanni* Boheman.
11. *Prioptera multiplagiata* Wagener.
12. *Prioptera bisignata* Boheman.

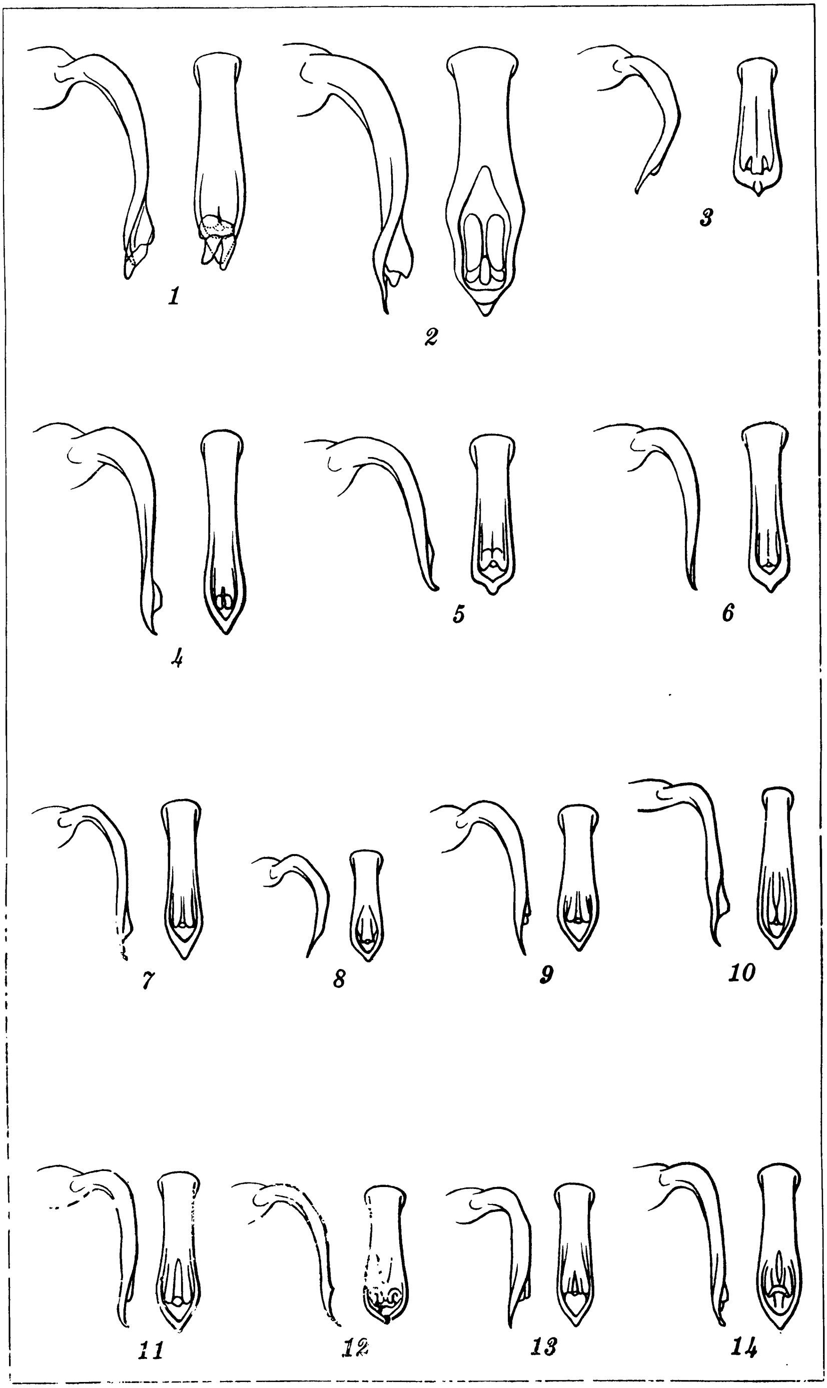
TAFEL 2

FIG. 1. *Prioptera angusta* Spaeth.
2. *Prioptera chinensis* Fabricius.
3. *Prioptera latissima* Wagener.
4. *Prioptera sospes* sp. nov.
5. *Prioptera octopustulata* Boheman.
6. *Prioptera subopaca* sp. nov.
7. *Prioptera immaculata* Wagener.
8. *Prioptera decemmaculata* Boheman.
9. *Prioptera impacata* sp. nov.
10. *Prioptera figurata* Weise.
11. *Prioptera scheerpeltzi* sp. nov.
12. *Prioptera sinuata* Olivier.
13. *Prioptera joloana* sp. nov.
14. *Prioptera trux* sp. nov.



TAFEL 1.

UNIV. OF MICH.



TAFEL 2.

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NOUVELLES FOURMIS DES PHILIPPINES

Par Carlo Menozzi

Chiavari, Italy

UNE PLANCHE

Les intéressantes fourmis décrites ci-dessous m'on été communiquées ou données par M. C. F. Baker, professeur aux Philippine College of Agriculture de Los Baños, que en remercie bien vivement. Elles montrent que la faune myrmecologique des Iles Philippines est encore assez peu.

DORYLINÆ

Aenictus bakeri sp. nov.

Mâle.—Brun roussâtre; pattes, mandibules, antennes roux brunâtre clair. Pilosité dressée, sur les mandibules, les scapes et les pattes, et d'un couleur jaunâtre. Pubescence assez dense sur les funicules, sur les côtés du thorax et sur l'abdomen. Lisse et luisant surtout sur la tête et le thorax, avec une fine ponctuation pilifère.

Tête, avec les yeux, d'un tiers plus large que longue fortement concave en devant, à bord cervical lègérement convexe, et l'antérieur faiblement echancré au milieu. Derrière la tête, les bords de l'occiput sont a peu prés droits fort convergent vers l'articulation, et prolongées en un col. Les mandibules deux fois plus longues que la largeur de la tête, et environ cinq fois plus longues que leur largeur maxime; subcylindrique, presque droites dans leur moitié basale se recourbent assez dans leur tiers terminal qui finit en pointe aigue. Fossettes antennaires profondes, occupant à peu prés la moitié de l'espace entre les yeux et les arêtes frontal. Celles-ci se terminent au niveau du milieu des yeux. Scape fortement comprimé dans son moitié distale, environs une fois plus long que large, atteint l'ocelle postérieur. Premier article du funicule presque deux fois plus long que épais, les deux suivantes à peine plus épais que longs, tous les autres, excepté le dernier, beaucoup plus épais que longs. Yeux grands et occupant tout les côtés de la tête. Ocelles, assez grands, perché sur une eminence du vertex; l'intervalle qui sépare l'ocelles latéraux du median est prés de deux fois plus large que leur diametre, et celui qui le sépare des yeux plus de trois fois.

Thorax ainsi large que la tête; pronotum trés courte, peu convexe devant; mesonotum dirigé horizontalement d'arrière en avant, deux fois plus long que large; scutellum assez proeminent; face declive de l'épinotum vertical, et un peu cachée sous le scutellum. Noeud du pédicule bien plus large que long, les bords lateraux convexes, relevés, et peu prolongés en arrière, face supérieure fortement concave.

Gastre cylindrique, non plus épais que le thorax. Stipites de l'armure génitale triangulaires, les volselle glabre, étroites et beaucoup plus longue que les valvules de la paramére interne, lesquels sont paralléles et longuement bifurqué.

Pattes courtes; cuisses brusquement et fortement renflées dans leur tiers distal.

Ailes enfumées de brun roussâtre.

Long. 7.3 mill.

Iligan, Lanao, Mindanao.

Je ne crois pas faire erreur en rattachant cette forme à *A. punctiventris* Em. dont il differe par sa taille plus grande, par ses ocelles perché sur une eminence du vertex, mais surtout par la conformation de sa tête (voir la fig. 1).

Stictoponera stylata sp. nov.

Ouvriére.—Corps couleur de poix; epistome, mandibules, antennes, hanches, tibias, et tarses roux brunâtre clair, cuisses brun foncé. Pilosité des pattes et antennes pas très longue, clairsemés et de couleur roussâtre. Assez luisante. Sculpture consistant en points-fossettes très grossiers, assez confluentes sur la tête et le thorax, plus espacés sur le pétiole et le postpétiole dont est en partie, postérieurement, lisse comme le reste de l'abdomen. Une pubescence courte sort des fossettes, et ne se remarque guère que de profil.

Tête beaucoup plus large derrière que devant, environ un tiers plus longue que large, profondament et largement échancrée à son bord occipital, avec les angles postérieur fort saillants. Mandibules triangulaires, submates, espacément striées. Epistome ruguex, fortement empressionée le long du bord antérieur qui est avancé en pointe, au milieu, sur la bouche. Aire frontale petite mais bien distincte. Arêtes frontales écartées l'une de l'autre et faiblement sinuées. Le scape dépasse le bord occipital d'un tiers, sa moitié distale est plus épaisse que l'autre moitié laquelle est un peu arquée. Les articles 1 à 7 du funicle sont bien plus longs que épais, les trois suivants à peu près subégaux, l'article terminal est plus de deux fois et demi ainsi long qu'épais. Yeux fortement bombés, et placés au dessus du milieu des côtés de la tête.

Dos du thorax médiocrement convexe; suture promésonotale et mésoépinotale imprimées par un très faible sillon mais bien visible. Le pronotum à deux epaules distinctes, subdentiformes, ainsi long que large. Mésonotum une fois et demi plus long que large. Profil de l'épinotum faiblement anguleux; la face basale derriére est ainsi large que longue, plane, et d'une moitié plus courte que la déclive; celle-ci descend en pente douce, avec ses bords très nets. Pétiole ¼ plus long que large, derriére il est ⅓ plus large que devant; les côtés convergents en avant dans leur tiers antérieur; vu de profil la face supérieure de cet article est fort convexe et s'abaisse fortement en arriére; le dessous présente vers l'articulation antérieure une large appendice triangulaire dirigée en avant. Article du postpétiole beaucoup plus large et ⅓ plus long que le pétiole, avec les côtés convexe; la face antérieure tronqué et uni à celle inférieure par un angle aigu.

Premier article du gastre plus large que long, presque ainsi large que la moitié de la longueur du postpétiole.

Hanche de pattes postérieures armée d'une courte épine.

Long. 8.7 mill.

Mount Maquiling, Laguna, Luzon.

Cette espéce diffère de *S. biroi* Em. par sa plus grande taille (5.5 mill. en *S. biroi*), par la tête plus long que large, par les yeux deplacés en arriére du milieu des côtés de la tête, et par la grande appendice au dessous du pétiole.

Trapeziopelta philippinensis sp. nov.

Ouvrière.—D'un brun de poix ca et la un peu roussâtre; mandibules, antennes, épistome, arêtes frontales, pattes, et extrémité de l'abdomen roussâtre. Partout des gros points espacés; le mesonotum, l'épinotum, et le pédicule fortement striées longitudinalement et mats, le reste sans sculpture fondamental et luisante. Une pilosité fine, pas trés longue, abondante sur la tête, scapes et pattes, trés rare, mais beaucoup plus longue (environ le double) sur le reste du corps; les funicules ont une fine pubescence.

Tête (sans les mandibules) distinctament un peu plus large que longue, à côtés convexe, le bord postérieur faiblement concave. Mandibules linéaires, presque ainsi longue que la ⅔ de la tête, assez luisantes, avec quelques points d'ou sortens des poils trés fins; au delà du milieu de leur longueur le bord masticateur est armé de deux dents qui sont reunis par une crête longitudinal, depuis ces dents elles sont fortement creusées en forme de faux, munis, aprés l'entaillure, d'un petit dent, et finissant en pointe aiguë. Epistome formant un bord étroit le long de la bouche, surplombé par les arêtes frontales entre lesquelles il se prolonge un peu en forme de coin; la partie plus haute de l'épistome s'avance en un long lobe qui est pourvu au bord antérieur d'une profonde echancrure en demi-lune limitée latéralement par deux appendices dentiformes obliquement tronquées. Arêtes frontales relativament petits, et peu élargies en avant. Sillon frontal profond surtout en arrière, n'atteignant pas le milieu de la longueur de la tête. Le scape atteint assez exactement le bord postérieur de la tête. Articles 2 à 7 du funicule un peu plus longs que épais, les dernieres quatre formant une massue bien distincte, et ils sont (excepté le derniére) un tiers plus longs que épais. Yeux bien dévelloppés, ovales et situés en avant du milieu des côtés de la tête.

Thorax étroit, un peu plus étroit que la tête; son profil dorsal faiblement convexe. Pronotum à côtés obtusament bordées, distinctement plus large que long, avec les angles antérieurs arrondis. Suture promésonotale bien distincte. Métanotum petit, plus courte que le pronotum. Suture mésoépinotale fortément imprimée et formant une ligne concave. Face declive de l'épinotum plus courte que la basale à laquelle elle passe par une courbe trés peu rapide. Noeud du pédicule élevé, verticalement tronqué devant et derrière, presque ainsi long que large, à côtés un peu comprimés et paralleles; vu de profil la face supérieure de cet article est convexe et s'abaisse faiblement en avant. Postpétiole trés convexe, un tiers plus large derrière que devant, ou il est de la même largueur que le pétiole; la devant et les côtés à peine convexe; le dessous présente vers l'articulation antérieur un petit dent. L'article suivant de l'abdomen plus long que le postpétiole, et bien plus large.

Long. 6.3 mill.

Tangkulan, Bukidnon, Mindanao.

Cette espéce est voisin de *T. bidens* Em., mais bien distincte par sa taille plus grande, par la sculpture de mésonotum, épinotum et du pedicule, et par le lobe médian de l'épistome plus échancré et pour cela plus distinctement bidenté. C'est la première espéce du genre habitant les Iles Philippines.

Centromyrmex donisthorpei sp. nov.

Femelle.—D'un jaune roussâtre à peine teint de brun sur la tête et le mésonotum; pattes et antennes jaunâtres sale.

Tête ovale-rectangulaire, à côtés médiocrement convexes, rétrécie devant, plus faiblement derrière, presque ainsi longue (sans les mandibules) que large, avec la face occipitale concave; submat, par une fine sousculpture, avec de nombreux points assez gros, plus confluentes sur les joues et sur le front, un peu plus espacés sur l'occiput; fossettes antennaires finement striées. Pubescence nulle; pilosité courte peu abondante et oblique. Mandibules fortement courbées en bas, lisses, à fine ponctation éparse d'ou sortent des poils dressés, bord masticateur long, finement et entiérement denticulé. Bord antérieur de l'épistome faiblement arqué, proéminant un peu en bosse devant les arêtes frontales, entre lesquelles son extrémité postérieure est longuement insinuée en con. Arêtes frontales assez écartées, avec un lobe médiocrement prononcé a leur partie antérieure. Sillon frontal fort marqué, postérieurement il atteint une large fossette triangulaire entre laquelle est placé l'ocelle impair. Le scape dépasse d'une fois son épaisseur le bord postérieur de la tête. Premier article du funicule beaucoup plus long que le suivant, tous, sauf le dernier, plus larges que long. Yeux plats, situés un peu en avant du milieu des côtés, ainsi grands que la distance qui les sépare du bord antérieur de la tête. L'intervalle entre l'ocelle antérieur et les latéraux à peine plus grand que le diamètre de ces dernier.

Pilosité du thorax encore plus courte et moins abondante que chez la tête; les gros points encore plus espacés et marquées seulement sur le scude du mesonotum, l'intervalles entre ces points presque lisses et luisant; le reste du thorax finement chagrinée. Le pronotum forme une demi-lune exacte, avec le bord antérieur tranchant et un peu saillant au milieu. Le mesonotum surplombe un peu le pronotum, et moins large que celuici, à peine plus long que large et bordé antérieurement. Scutellum petit, ses angles antérieurs fort prolongées en avant entre l'écaille du mesonotum et les mesopleures. Epinotum avec la face basale longue comme $\frac{1}{4}$ de la hauteur de la déclive.

Pédicule et abdomen luisantes; le premier tout a fait lisse, le second avec des points comme chez la tête et l'écaille du mesonotum, mais beaucoup plus petits; l'un et l'autre à pilosité habituelle.

Noeud du pedicule arrondie au sommet, à face antérieur concave et postérieure convexe, un peu petiolé devant. Sous le pedicule une épine pointue.

Abdomen faiblement rétréci entre ses deux premier segments.

Ailes assez fortement enfumées de brun, densément pubescentes et à nervures brunes; trois cellules cubitales, une discoidale, et la cellule radiale fermée.

Long. 7 mill.

Iligan (*19444*) et Kolambugan, Mindanao; deux exemplaires.

Euponera (Trachymesopus) myropola sp. nov.

Femelle.—Jaune roussâtre, plus dilué sur les appendices; gastre brun jaunâtre. Tête et thorax opaques, finement et densément réticulé-ponctué; pedicule et gastre lisses et luisantes. Pubescence assez abondante, courte sur la tête et le thorax, plus longue sur le gastre.

Tête rectangulaire, environ un tiers plus longue que large, ainsi étroite derriére que devant, le bord postérieur droit, la face occipitale concave. Palpes maxillaires de deux articles. Mandibules luisant, lisses avec quelques petits points êpars d'ou sortent des poils dressés, le bord basal ainsi long comme une moitié du bord masticateur, celui-ci armé des 7 petits dents. Epistome court, convexe et fortement carené, son bord antérieur prolongé en avant et pourvu au milieu d'une courte pointe. Le scape atteint environ le 5 me ou le 6 me postérieur de la tête. Articles 2 à 6 du funicule presque le double plus épais que long; l'avant dernier est encore un peu plus large que long et le dernier deux fois et demi plus long que large et à peine plus long que les deux articles précedents réunis. Yeux placés au cinquième antérieur des côtés de la tête. Sillon frontal três marqué, et atteignant l'ocelle median. Ocelles petits.

Thorax un peu plus étroit que la tête, le dos plat sur le profil. Pronotum distinctement plus long que large, sa plus grande largueur un peu en arrière du milieu. Mesonotum petit presque ainsi long que le pronotum. Scutellum et metanotum petits, ces dernier un peu enforcé et caché sous le scutellum. Face basale de l'épinotum trapézoidale, un quart à un tiers plus large que longue, convexe d'une côte a l'autre; face declive faiblement concave au centre, les bords convexes en haut, forment un angle net mais moussé avec la face basale. Ecaille du pedicule ainsi haute que l'épinotum; vu de profil elle est presque ainsi large à la base qu'au sommet et deux fois plus haute que longue, le devant convexe d'une côte à l'autre, la face postérieur concave; vu de dessus elle est deux fois plus large que longue, en demi cercle devant, concave derrière. Postpétiole postérieurement une demi fois plus large que le noeud du pétiole, et un quart plus large que long.

Gastre médiocrement étranglé entre le postpétiole et le segment suivant, celui-ci pas plus long de celui-la, mais bien plus large.

Long. 5.7 mill.

Los Baños, Laguna, Luzon.

Cette espèce est bien distincte de *E. darwini* For. et forme voisines par sa taille plus petite, par l'épistome fortement carené et par les dents des mandibules petites. Elle est aussi moins poilue.

Liomyrmex tagalanus sp. nov.

Femelle.—Noire brunâtre; mandibules, antennes, pattes, et bord postérieur de chaque segments du gastre rouge brunâtre. Tête, thorax, pédicule, et pattes submats; gastre luisant; lisse, ou trés finement chagriné, sauf le mesopleure, l'épinotum et péduncule stries; ces stries, trés denses dans le pétiole et postpétiole, s'affancet peu à peu sur la face basale de l'épinotum autant que postérieurement est presque polì. Seulement quelques poils dressés autour de la bouche, et vers l'extrémité de l'abdomen. Pubescence adjacente trés fine, assez abondant partout, surtout sur le thorax, scapes et pattes.

Tête rectangulaire, longue 2 mill. et large 1.6 mill., à bord occipital légèrement concave. Mandibules lisses, avec quelques points piliferes épars, trés épaisses et massives, armées de 4 dents, le dernier plus robuste. Epistome convexe de haut en bas, le bord antérieur largement mais peu profondement echancré. Arêtes frontales trés courtes, ne dépassant pas le niveau du bord antérieur des yeux. Fossettes antennaires profondes. Antennes des 11 articles. Le scape n'atteint pas le tiers postérieur de la tête. Premier article du funicule ainsi long que les trois suivantes, 2–6 plus du double larges que longs, les trois derniers forment une massue presque ainsi long que le $\frac{2}{3}$ du reste de funicule. Yeux faiblement convexes, assez grands, placés un peu en avant du milieu des côtés de la tête. Ocelles situées au fond des petites fossettes.

Thorax beaucoup plus étroit que la tête, rectangulaire, deux fois et demi plus long que large à côtés presque paralleles, un peu rentrant au milieu. Pronotum court, bordé d'un arête nette.

Disque du mesonotum plus étroit en avant que en arrière, a bord antérieur arrondi, le postérieur tronqué avec les angles obliquament emussées. Le scutellum ainsi grand que la face basale de l'épinotum. Le metanotum trés étroit et à peine manifeste en dessus. Les deux faces de l'épinotum subégales formant ensemble un angle trés arrondi.

Le noeud du pétiole vu par dessus est deux fois plus large que long, avec les côtés prolongés en pointe en avant, assez concave d'avant en arrière et légèrement silloné en long au milieu; vu de côté il est beaucoup plus haut que long; en dessous est pourve d'une trés large appendice. Postpétiole plus large que le noeud du pétiole, un tiers plus large que long, fortement et largement concave dans la moitié antérieur; ses côtés font légèrement saille en dehors et les angles antérieurs sont un peu prolongés en avant; au dessus on remarque un fort dent assez long, avec l'apex recourbé en arrière.

Gastre étroit, allongé et cylindrique, presque comme chez le femelles de *Solenopsis*. Pattes courtes et robuste; fémur comprimés, surtout l'antérieurs.

Ailes jaunâtres clair, à nervures brun foncé.

Long. 9.3 mill.

Kolambugan, Lanao, Mindanao.

Vollenhovia ambitiosa sp. nov.

Femelle.—D'un roux brunâtre ou d'un brun rougeâtre; menbres et mandibules d'un jaune roussâtre. Pilosité à demi-couchée sur le corps et sur les menbres, assez abondant, mais pas longue, passant à la pubescence et entiérement roussâtre ou d'un rouge jaunâtre. Dessus de la tête, pronotum et mesonotum (y compris les flancs des ces deux segments) sauf un espace longitudinal lisse au milieu de ce segment, reguliérement et fortement ridés reticulés; scutellum, épinotum, péduncule et gastre lisses et luisants.

Tête à peine plus longue que large; les côtés faiblement convexes, le bord postérieur presque droit, la face occipitale concave. Mandibules submates, courtes, avec quelques gros points, armées de cinq dents. Epistome étroit fortement bicaréné et creusé au milieu de son bord antérieur. Aire frontale petite mais trés bien distincte et luisante. Arêtes frontales ainsi longs que une moitié de l'intervalle entre ses extrémités antérieurs. Le scape, arqué a la base, un peu épais dans sa moitié distale, atteint presque le milieu de la tête. Articles 2 à 9 du funicule bien plus larges que longs. Massue nettement des trois articles.

Les yeux situés au milieu des côtés de la tête. Ocelles petits; le médian est atteint par un sillon frontal faiblement marqué, mais large, sans sculpture et assez luisant.

Thorax non plus large que la tête. Pronotum subbordé antérieurement, à angles trés nets. Face declive de l'épinotum oblique, concave, quatre fois plus longue que la face basale. Pédicule du pétiole pas plus long que son noeud; ce dernier faiblement biconcave de profil, obtus en haut, et bien plus haut que long; au dessous de l'extrémité antérieur une petite appendice comprimé. Postpétiole convexe, plus large que long, et plus bas que le noeud du pétiole; le dessous est pourvu d'un dent au bord antérieur.

Gastre relativement petit.

Long. 6.3 mill.

Tangkulan, Bukidnon, Mindanao.

Le dent au-dessous du postpétiole caracterisé trés bien cette nouvelle espéce de *Vollenhovia.*

Crematogaster (Physocrema) bakeri sp. nov.

Ouvrière.—D'un brun rougeâtre clair; dessus de la tête et extrémité du gastre brunâtres. Assez luisante. Faiblement chagriné et parsemée de trés petits points pilifères. Sans poils dressées, sauf une rangée le long du bord antérieur de l'épistome, le reste avec une fine pubescence adjacente éparse.

Tête carrée, un peu plus longue que large, ainsi large devant que derrière, à côtés faiblement convexes, et échancrée derrière. Mandibules fortement striées pontuées, à bord externe à peine convexe, armées de 4 (ou 5?) dents. Epistome peu convexe en avant, plus fortement en arrière, son bord antérieur arqué au milieu, échancré sur les côtés. Arêtes frontales un peu rapprochées devant, divergeant médiocrement en arrière ou elles sont prolongées jusqu'au bord antérieur des yeux. Ceux-ci ovales, plutôt petits, et placés en arrière du millieu des côtés de la tête. Le scape grêle et faiblement courbé à la base, depasse le bord occipital d'environ deux fois son épaisseur. Articles 2 à 6 du funicule un peu plus épais que longs. Massue des trois articles. Fossettes antennaires profondes.

Promésonotum assez petit, beaucoup plus étroit que la tête et divisé de l'épinotum par un fort étranglement et par une suture mésoépinotale bien distincte. Epinotum ainsi large que la tête, et plus large, presque de $\frac{1}{3}$ que le promésonotum; le profil est fortement convexe (gibbeux) dans sa moitié antérieur pedant que sa moitié postérieur est plane, trés oblique d'arrière en avant, et profondement concave le long de la ligne médian longitudinale. Cette concavité est prolongué un peu sur la face declive, atteignant environ la milieu de sa hauteur, laquelle est de ¼ plus courte que la basale, avec les côtés verticales, subbordées et réunis a celles de la basale par un angle obtus. Sur les flancs de ce segment l'on remarque placé au-dessous du stigmate une éminence cratériforme, pourvu à l'apex d'un trou subtriangulaire, et parcouru des stries convergent du bas en haut.

Pétiole ovolaire, trois fois plus long que sa plus grande largueur et concave dans sa face supérieure. Postpétiole à peine plus large que long, vu de profil il est convexe et beaucoup plus haut que le pétiole.

Gastre relativement petit. Pattes longues et grêles.

Long. 4.7 mill.

Davao, Mindanao (*6947*).

Je ne puis rattacher cet forme à aucune des epéces de sousgenre *Physocrema* connues; le pétiole et l'épinotum sont assez caractéristiques.

Crematogaster (Atopogyne ?) vitalisi sp. nov.

Femelle.—Tête et thorax d'un brun noirâtre; mandibules, antennes, pattes, pedicule, et gastre d'un brun jaunâtre. Pubescence jaunâtre, adjacente, longue, assez abondant sans être trés dens, partout le corps. Densement et finement strié, avec des points épars; la face declive de l'épinotum et les flancs du thorax avec des striés plus grossières.

Tête bien plus longue que large, longue (sans les mandibules) 2.8 mill. et large 1.97 mill. a la hauteur des yeux; à côtés presque droit. Bord postérieur faiblement concave, et angles postérieurs trés peu arrondis. Mandibules grandes, subopaques, fortements striées avec une abondante ponctuation pilifères; leur bord externe est peu courbé, le bord masticateur est concave et armé de cinq dents, plus ou moins émoussée, excepté l'apicale aigue. Epistome fortement convexe, à bord antérieur un peu avancé en lob dans son tiers médian, et biéchancré lateralement. Aire frontales indistincte. Pas de sillon frontal. Fossettes clypéales bien marquées. Arêtes frontales droit, courtes, c'est a dire, un peu moins longues que leur intervalle postérieur. Le scape qui atteint l'ocelle médian, est arqué et épaissi à l'extrémité. Premier article du funicule presque ainsi long que les deux suivantes, articles 2–6 à peine plus longs que épais. Massue des trois (ou quatre?) articles. Yeux situés au milieu des côtés de la tête.

Thorax plus étroit que la tête. Mesonotum du double plus long que large; celle-ci et le scutellum forment une faible convexité sur le profil. Face basale de l'épinotum de deux tiers plus courte que la declive et pourvu de deux petits tubercules. Pétiole petit, en ovale transverse, un peu moins de deux fois plus large que long. Postpétiole globuleux, ainsi large que long, distinctement élargi devant et rétréci en derrière, à côtés trés convexes sans trace d'impression ou de sillon longitudinal.

Ailes longues, teintées de brun roussâtre, avec le nervures brunes. Une cellule cubitale et une radiale fermée.

Pattes courtes; le premier article des tarses postérieurs peu plus long que la tibia.

Long. 8.6 mill.

Iligan, Lanao, Mindanao.

Il s'agit d'une espéce fort aberrant qui je place provisoirement dans le sous-genre *Atopogyne* pour avoir certains affinités avec *C.* (*Atopogyne*) *depressa* Latreille.

ILLUSTRATION

PLANCHE 1

FIG. 1. *Aenictus bakeri* sp. nov.; *a*, Tête de face; *b*, armure génitale de profil.

2. *Stictoponera stylata* sp. nov.; *a*, Tête de face; *b*, profil de l'épinotum et du pédicule.

3. *Trapeziopelta philippinensis* sp. nov. Tête de face.

4. *Centromyrmex donisthorpei* sp. nov.; *a*, Tête de face; *b*, épinotum et pédicule de profil.

5. *Liomyrmex tagalanus* sp. nov. Pédicule de profil.

6. *Crematogaster* (*Physocrema*) *bakeri* sp. nov. Thorax et pédicule de profil.

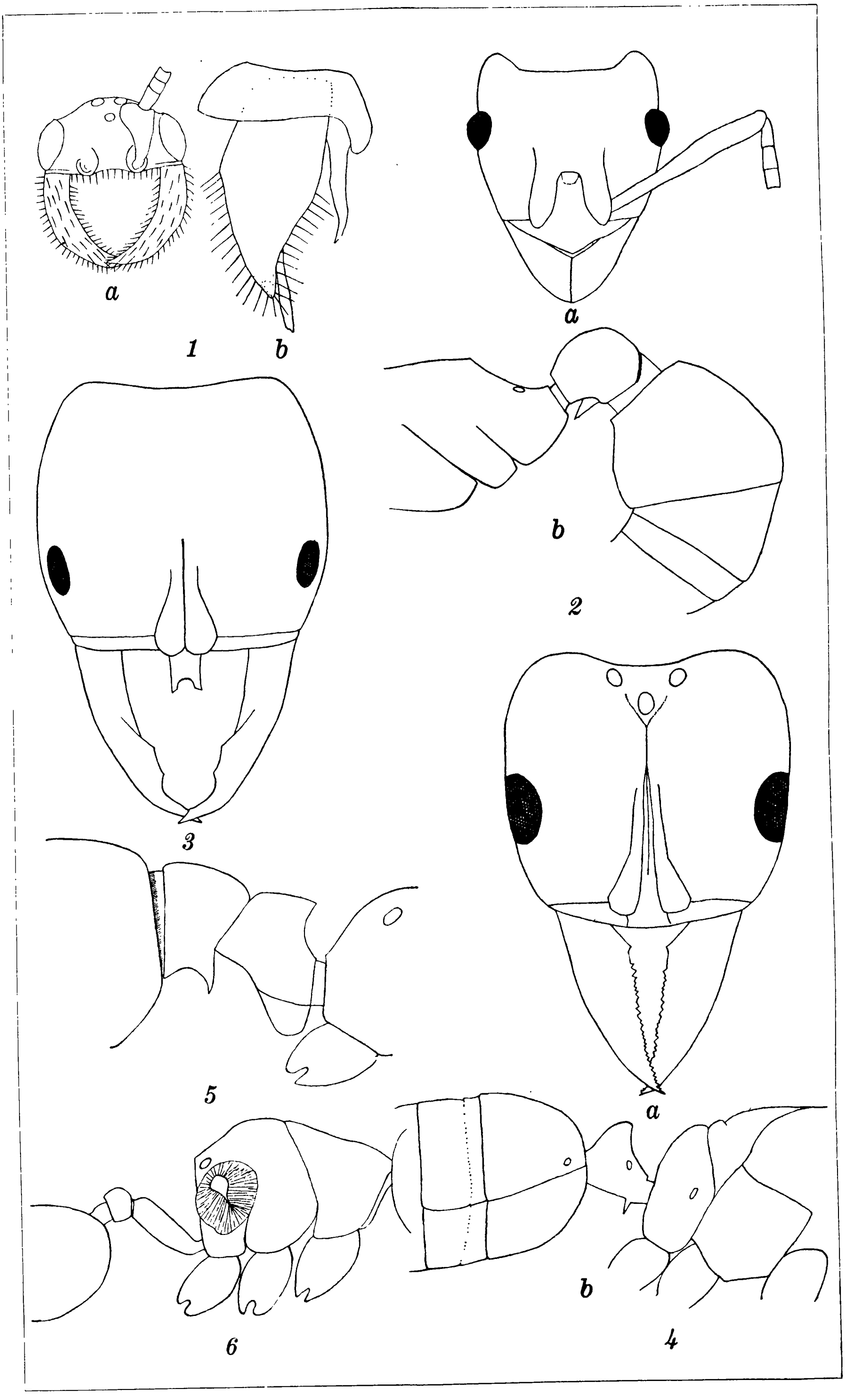

PLANCHE 1.

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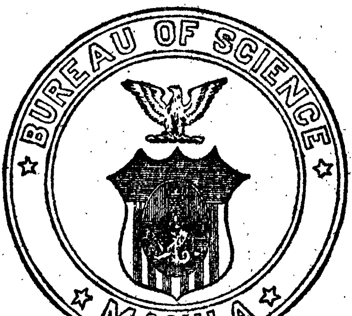

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1925

213007

THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science of the Government of the Philippine Islands

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THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 28 DECEMBER, 1925 NO. 4

PHILIPPINE CITRUS FRUITS

By A. H. WELLS, F. AGCAOILI, and MARIA Y. OROSA

Chemists, Bureau of Science, Manila

SIX PLATES AND TWO TEXT FIGURES

Citrus fruits belong to the family Rutaceæ, and they are native to southwestern Asia and adjacent islands. The Philippines are the habitat of a few varieties. The following varieties are indigenous to the Philippine Islands:[1]

Citrus hystrix var. *micrantha* (Wester); local name, biasong.
Citrus hystrix var. *microcarpa* (Wester) Merrill; local name, samuyau.
Citrus hystrix var. *southwickii* (Wester) Merrill; local name, limau.
Citrus hystrix var. *torosa* (Blanco) Wester; local name, kolobot.
Citrus hystrix var. *boholensis* Wester.
Citrus hystrix de Candolle; local name, kabuyau.
Citrus hystrix var. *macrophylla* (Wester) Merrill; local name, alimau.
Citrus limonia var. *pseudolimonum* (Wester) Merrill; local name, lombog.
Citrus aurantifolia var. *miaray* (Wester) Merrill.

According to Mr. P. J. Wester, of the Bureau of Agriculture, *Citrus webberi* Wester, *Citrus webberi* var. *montana* Wester, and *Citrus longispina* Wester are also indigenous to the Philippine Islands.

No evidence could be found that the Spaniards during their administration in the Philippines had introduced any of the Spanish, Italian, Japanese, Chinese, or other variety of citrus into the Islands. To the Bureau of Agriculture belongs the credit of having introduced new varieties.

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[1] Merrill, E. D. Enumeration of Philippine Plants, Bureau of Science Publication 18, 2 (1923) 342–345.

Table 1 enumerates the species and varieties of citrus that have been introduced from foreign countries each year, from 1910 to 1923. They were grown at the Lamao Experiment Station and the success of these growing tests indicates that the introduced forms are well adapted to Philippine conditions.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries.*

P. I. No.	Year and kind.	Scientific name.	Origin.
	1910		
	Oranges:		
	Bahia	*Citrus sinensis* Osbeck	Australia.
	Mediterranean	do	Do.
	Navalencia	do	Do.
	Washington navel	do	Do.
	Lemons:		
	Belair	*Citrus limonia* Osbeck	Do.
	Lisbon	do	Do.
	Rough lemon	do	Do.
	Villafranca	do	Do.
	1911		
	Oranges:		
51	Valencia	*Citrus sinensis* Osbeck	Monrovia, California.
563	Sour Orange	*Citrus aurantium* Linnæus	Palm Beach, Florida.
1593	Do	do	Vil. And. & Co. Paris.
	Lemons:		
691	Belair	*Citrus limonia* Osbeck	Sydney, Australia.
562		do	Palm Beach, Florida.
693	Lisbon	do	Australia.
559	Rough lemon	do	Porto Rico.
819	Do	do	Miami, Florida.
692	Villafranca	do	Sydney, Australia.
	Limes:		
530		*Citrus aurantifolia* (Swingle)	Miami, Florida.
617		do	Do.
619		do	Do.
818	Lime	do	Do.
	Pomelos:		
622	Pomelo	*Citrus maxima* Merrill	Java.
707	Do	do	Sydney, Australia.
560		do	Porto Rico.
	Mandarins:		
1267	Szinkom	*Citrus nobilis* Loureiro	Saharanpur, India.
1275	Unshiu	do	Do.
	1912		
	Oranges:		
1720	Bahia	*Citrus sinensis* Osbeck	Australia.
706	Bahia navel	do	Do.
1717	Buckeye navel	do	Do.
1260	Excelsior	do	Saharanpur, India.
1701	Holdfast	do	Australia.
1638	Japanese orange	*Citrus aurantium* Linnæus	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1912		
	Oranges—Continued.		
1719	Jaffa	*Citrus aurantium* Linnæus	Australia.
1637	Do	do.	United States.
1258	Do	do.	Saharanpur, India.
1722	Joppa	do.	Australia.
1714	Larrantta	do.	Do.
1259	Malta blood	do.	Saharanpur, India.
1743	Mediterranean	do.	Australia.
1705	Do	do.	Do.
1916	Majorca	do.	Oneco, Florida.
1742	Navalencia	do.	Australia.
1635	Pineapple	do.	United States.
2406	Pongkan	do.	Formosa, Japan.
1917	Ruby	do.	Oneco, Florida.
1639	Do	do.	United States.
1277	Seville	do.	Saharanpur, India.
1270	St. Michael's blood	*Citrus sinensis* Osbeck	Do.
1721	St. Michael	do.	Australia.
740	Sweet	do.	California, U. S.
1706	Valencia	do.	Do.
1634	Do	do.	United States.
1711	Washington navel	do.	Australia.
1636	Do	do.	United States.
1744	Do	do.	Australia.
1266	Whitaker	do.	Saharanpur, India.
1709	White siletta	do.	Australia.
1715	Do	do.	Do.
1645		do.	Hongkong, China.
1736		do.	Do.
2344		do.	Ogasawara Island.
1448		do.	Florida, U. S.
1264	Sour Florida	*Citrus aurantium* Linnæus	Saharanpur, India.
2357	Sour orange	do.	Miami, Florida.
1779	Do	do.	Do.
1453	Do	do.	Do.
2426	Do	do.	Do.
1440		do.	Florida, U. S.
	Lemons:		
1704	Bengal	*Citrus limonia* Osbeck	Australia.
1782		do.	Hongkong, China.
1703	Lisbon variegated	do.	Australia.
1091	Rough lemon	do.	Miami, Florida.
1710	Sicily	do.	Australia.
1712	Thornless	do.	Do.
1702	Villafranca	do.	Do.
	Limes:		
1708	Tahiti	*Citrus aurantifolia* Swingle	Do.
936		do.	U. S. Dept. of Agriculture.
980		do.	Miami, Florida.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1912		
	Pomelos and grapefruits:		
1333	Ellen grapefruit	*Citrus maxima* Merrill	Oneco, Florida.
1334	Pernambuco grapefruit	do.	Do.
1646	Pomelo	do.	Hongkong, China.
2819	Pomelo red	do.	Calcutta, India.
1995	Siamese (seedless)	do.	Bangkok, Siam.
2177	Siamese	do.	Do.
2361	Siamese (seedless)	do.	Do.
2300	Stewart	do.	Florida, U. S.
1713	Triumph	do.	Australia.
	Mandarins:		
1265	China	*Citrus nobilis* Loureiro	Saharanpur, India.
1647		do.	Hongkong, China.
1913		do.	Queensland, Australia.
2346	Coolie	do.	Hongkong, China.
1918	Dancy	do.	Oneco, Florida.
1271	Kishiu	do.	Saharanpur, India.
1272	Konda narum	do.	Do.
1256	Ladu	do.	Do.
1257	Omikinkan	do.	Do.
1335	Oneco	do.	Oneco, Florida.
1261	Orange mandarin	do.	Saharanpur, India.
1263	Sikkim	do.	Do.
1262	Suntara common	do.	Do.
1276	Suntara nagpur	do.	Do.
	Citrons:		
1278	Finger	*Citrus medica* Linnæus	Do.
1716	Common citron	do.	Australia.
	Citrus hybrids:		
1948	Sampson tangelo (tangerine × grapefruit).	*Citrus* hybrid	Marathon, Florida.
1618	Do	do.	U. S. Dept. of Agriculture.
	Citrus species:		
1278	Finger	*Citrus* sp	Saharanpur, India.
1269	Kaula	do.	Do.
2246		do.	West Coast, Borneo.
1268	Malta	do.	Saharanpur, India.
1273	Natsu-daidai	do.	Do.
2407	Sea Kam	do.	Formosa, Japan.
1274	Vanille	do.	Saharanpur, India.
2408	Tang Kam	do.	Do.
	1913		
	Oranges:		
2705	Bessie	*Citrus sinensis* Osbeck	Florida, U. S.
2698	Boone	do.	Do.
3100	Buckeye navel	do.	Hongkong, China.
2895	Cajel	do.	Guam.
2709	Centennial	do.	Florida, U. S.
2708	Du Roi	do.	Do.
3886	Do	do.	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1913		
	Oranges—Continued.		
2689	Enterprise (seedless)	*Citrus sinensis* Osbeck	Florida, U. S.
2685	Everbearing	do.	Do.
2701	Foster	do.	Do.
2691	Homosassa	do.	Do.
3101	Do	do.	Do.
3878	Kiowan	do.	Bangkok, Siam.
2694	Majorca	do.	Florida, U. S.
2688	Maltese oval	do.	Do.
2697	Maltese blood	do.	Do.
3104	Do	do.	Hongkong, China.
2704	Magnum bonum	do.	Florida, U. S.
2699	Madam Vinous	do.	Do.
2692	Nonpareil	do.	Do.
2706	Old vine	do.	Do.
2707	Paperind	do.	Do.
3103	Parramotta	do.	Do.
2695	Parson Brown	do.	Do.
2686	Pineapple	do.	Do.
3102	St. Jago	do.	Calcutta, India.
2696	Tardiff	do.	Florida, U. S.
3843		do.	Saigon, Indo China.
2662	Sour orange	*Citrus aurantium* Linnæus	Florida, U. S.
3255	Do	do.	Porto Rico.
2678	Do	do.	Zanzibar.
2511	Do	do.	Florida, U. S.
	Lemons:		
3898	Lamb's lemon	*Citrus limonia* Osbeck	Oneco, Florida.
3590	Lemon	do.	Hongkong, China.
	Limes:		
2822	Kagzi country	*Citrus aurantifolia* Swingle	Calcutta, India.
2823	Kagzi China	do.	Do.
2824	Kagzi Narengi	do.	Do.
2825	Pati country	do.	Do.
2882	Pati China	do.	Do.
2826	Sarvati	do.	Do.
	Pomelos:		
2687	Duncan	*Citrus maxima* Merrill	Florida, U. S.
3884	Foster	do.	Do.
3877	Hao Phaang	do.	Do.
2700	McCarthy	do.	Do.
3882	Do	do.	Do.
4121	Do	do.	Do.
2690	Marsh (seedless)	do.	Do.
3874	Nakoin chaisi	do.	Bangkok, Siam.
3875	Do	do.	Do.
3876	Do	do.	Do.
2819	Red pomelo	do.	Calcutta, India.
3384	Saigon	do.	Saigon, Indo China.
3438	Seedless pomelo	do.	Bangkok, Siam.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1913		
	Pomelos—Continued.		
3390	Siamese	*Citrus maxima* Merrill	Bangkok, Siam.
3389	Siamese (seedless)	do.	Do.
3440	Siamese pomelo	do.	Do.
3441	Do	do.	Do.
3442	Do	do.	Do.
2820	White pomelo	do.	Calcutta, India.
3391	Yugelar	do.	Bangkok, Siam.
3392	Do	do.	Do.
2524		do.	Japan.
	Mandarins:		
2984	Chinese	*Citrus nobilis* Loureiro	Hongkong, China.
2693	King	do.	Florida, U. S.
3883	Oneco	do.	Oneco, Florida.
3387		do.	Saigon, Indo China.
	Citrons:		
3836		*Citrus medica* Linnæus	Do.
3837		do.	Do.
	Citrus hybrids:		
3256	Bitter sweet	*Citrus* hybrid	Porto Rico.
3897	Tangerine (mandarin)	do.	Oneco, Florida.
3884	Sampson tangelo (tangerine × grapefruit)		
3885	Do	*Citrus* hybrid	Oneco, Florida.
3886	Do	do.	Do.
	Citrus species:		
3385		*Citrus* sp	Saigon, Indo China.
3838		do.	Do.
3839		do.	Do.
3386		do.	Do.
3842		do.	Do.
3833		do.	Do.
3841		do.	Do.
3844		do.	Do.
3834		do.	Do.
3835		do.	Do.
2523		do.	Ogasawara, Japan.
	1914		
	Oranges:		
4717	Brown	*Citrus sinensis* Osbeck	Florida, U. S.
4785	Blood orange	do.	New South Wales, Australia.
4124	Carleton	do.	Florida, U. S.
1807	Coolie	do.	Hongkong, China.
4120	Du Roi	do.	Florida, U. S.
4119	Dugat	do.	Do.
4126	Foster	do.	Do.
4783	Homosassa	do.	Sydney, Australia.
5078	Keola	*Citrus* sp	Calcutta, India.
4123	Magnum bonum	*Citrus sinensis* Osbeck	Florida, U. S.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1914		
	Oranges—Continued.		
4782	Parramotta	*Citrus* sp	Sydney, Australia.
4117	Parson Brown	*Citrus sinensis* Osbeck	Florida, U. S.
4788	St. Jago	do	Australia.
4884		do	Cochin-China.
	Lemons:		
4804	African sweet	*Citrus limonia* Osbeck	Queensland, Australia.
4883		do	Cochin-China.
5175		do	Japan.
	Limes:		
5072	Alachi	*Citrus aurantifolia* Swingle	Calcutta, India.
5067	Cora	do	Do.
3669	Everglade	do	United States.
5068	Kagzi	do	Calcutta, India.
5070	Kalamba	do	Do.
3670		do	U. S. Dept. of Agriculture.
5069	Kagzi	do	Calcutta, India.
5073	Pati	do	Do.
5071	Sarvati	do	Do.
4122	Tahiti	do	Florida, U. S.
5176		do	Japan.
	Pomelos and grapefruits:		
5076	Hazareh pomelo	*Citrus maxima* Merrill	Calcutta, India.
5074	Kalsia	do	Do.
1707	Marsh grapefruit (seedless).	do	Australia.
4121	McCarthy	do	Florida, U. S.
4125	Royal grapefruit	do	Do.
5075	Society's pomelo	do	Calcutta, India.
4118	Walters grapefruit	do	Florida, U. S.
5170		do	Japan.
	Mandarins:		
4785	Blood orange	*Citrus* sp	New South Wales, Australia.
4787	Cantor	do	Do.
4784	Ellendale beauty mandarin.	do	Do.
5174		*Citrus nobilis* Loureiro	Japan.
5173	Saagkam	do	Do.
4786	Scarlet mandarin	*Citrus* sp	New South Wales, Australia.
4812	Citrus hybrid: Sampson tangelo (tangerine × grapefruit).	*Citrus* hybrid	Washington, D. C.
	Citrus species:		
4811	King of Siam orange		
5077	Sikkim	*Citrus* sp	Calcutta, India.
5081		do	Do.
5082		do	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1914		
	Citrus species—Continued.		
5169		*Citrus* sp.	Japan.
5171		do.	Do.
5172		do.	Do.
	1915		
	Oranges:		
5151	Cajel	*Citrus sinensis* Osbeck	Guam.
5149	Lalangha magas	do.	Do.
5352		do.	Java.
	Lemons:		
5148	Limon real	*Citrus excelsa* Wester	Guam.
5150	Limon China	*Citrus* sp.	Do.
	Limes:		
5184	Kusaic	*Citrus aurantifolia* Swingle	Honolulu, Hawaii.
5182	Do	do.	Japan.
5183	Low's seedless	do.	Honolulu, Hawaii.
5186	Makawao	do.	Do.
5163	Tahiti	do.	Do.
5176	Lime	do.	Japan.
	Pomelos:		
5167	Whitney's imperial pomelo.	*Citrus maxima* Merrill	Honolulu, Hawaii.
5185	Do	do.	Do.
5187	Mandarin: Willow leaved	*Citrus nobilis* Loureiro	Do.
5236	Citron: Cidra	*Citrus medica* Linnæus	British North Borneo.
	1916		
	Lemons:		
5686	Lemon	*Citrus* sp.	Costa Rica.
5690	Sweet lemon	do.	Do.
	Pomelos:		
5607	Hirado Buntan	*Citrus maxima* Merrill	Nagasaki, Japan.
5550 to 6004	Citrus hybrids [a]	*Citrus* hybrid	Washington, D. C.
	1917		
6005	Pomelo: Chinese pomelo	*Citrus maxima* Merrill	Do.
	Citrus hybrids:		
6060	Citrange (*Poncirus trifoliata*).[b]	*Citrus* hybrid	Do.
6061 to 6064	Citrangelo (citrange × grapefruit).	do.	Do.
6065	Citrange (*Poncirus trifoliata* × orange).	do.	Do.
6066	Citrangelo (citrange × grapefruit).	do.	Do.

[a] There is no record as to the species that were crossed.

[b] *Citrus trifoliata* is now *Poncirus trifoliata*.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6067	Citrangemon (citrange × lemon).	*Citrus* hybrid	Washington, D. C.
6068	Citrangedin (citrange × calamondin).	do.	Do.
6069	Do	do.	Do.
6070	Citrangime (citrange × lime).	do.	Do.
6071	Citrangor (citrange × orange).	do.	Do.
6072	Do	do.	Do.
6073	Citranguma (citrange × Satsuma).	do.	Do.
6074	Do	do.	Do.
6075 to 6082	Citradia (*Poncirus trifoliata* × sour orange).	do.	Do.
6083 to 6090	Citrandarin (*Poncirus trifoliata* × mandarin).	do.	Do.
6091 to 6102	Citrumelo (*Poncirus trifoliata* × grapefruit).	do.	Do.
6103	Citrunshu (*Poncirus trifoliata* × Satsuma).	do.	Do.
6104	Do	do.	Do.
6105	Citrumquat (*Poncirus trifoliata* × kumquat).	do.	Do.
6106	Do	do.	Do.
6107	Citrange (*Poncirus trifoliata* × orange).	do.	Do.
6108	Do	do.	Do.
6109	Do	do.	Do.
6110	Citrange seedless (Rusk) (*Poncirus trifoliata* × orange).	do.	Do.
6111	Citrange seedless (Colman) (*Poncirus trifoliata* × orange).	do.	Do.
6112	Citrange seedless (Morton) (*Poncirus trifoliata* × orange).	do.	Do.
6113	Citrange seedless (Savage) (*Poncirus trifoliata* × orange).	do.	Do.
6114	Citrange seedless (White) (*Poncirus trifoliata* × orange).	do.	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6115	Faustrimedin (Australian finger lime × calamondin orange).	*Citrus* hybrid	Washington, D. C.
6116	Do	do	Do.
6117 to 6126	Faustrime (Australian finger lime × lime).	do	Do.
6127 6128 6129	Faustrimon (Australian finger lime × lemon).	do	Do.
6130 to 6135	Tangelo (Oneco orange × grapefruit); (Clementine orange × grapefruit); (tangerine × grapefruit); (mandarin × grapefruit).	do	Do.
6136	Oranguma (orange × Satsuma).	do	Do.
6137	Orangelo (orange × grapefruit).	do	Do.
6138	Sapodia (sour pomelo × sour orange).	do	Do.
6141	Citrangequat (citrange × kumquat).	do	Do.
6139	Sapomaldin (sour pomelo × calamondin).	do	Do.
6140	Do	do	Do.
6142	Citrangequat (citrange × kumquat).	do	Do.
6143	Citrangor (citrange × orange).	do	Do.
6144	Do	do	Do.
6145	Do	do	Do.
6146	Citrangime (citrange × lime).	do	Do.
6147	Citrangemon (citrange × lemon).	do	Do.
6148	Do	do	Do.
6149	Citranguma (citrange × Satsuma).	do	Do.
6150	Do	do	Do.
6151 to 6154	Citrangedin (citrange × calamondin).	do	Do.
6155 to 6171	Citrangelo (citrange × grapefruit).	do	Do.
6172	Citrangor (citrange × orange).	do	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6173	Citrangor (citrange × orange).	*Citrus* hybrid	Washington, D. C.
6174 to 6178	Citrumelo (*Poncirus trifoliata* × grapefruit).	do	Do.
6179 to 6201	Citrange (*Poncirus trifoliata* × orange).	do	Do.
6202 to 6210	Citrandarin (*Poncirus trifoliata* × mandarin).	do	Do.
6211	Citrumelo (*Poncirus trifoliata* × grapefruit).	do	Do.
6212	Do		
6213	Citrunshu (*Poncirus trifoliata* × Satsuma).	do	Do.
6214 to 6224	Citremon (*Poncirus trifoliata* × lemon).	do	Do.
6225	Sour lime (no *trifoliata* blood; miscellaneous).	do	Do.
6226	Lemonime (lemon × lime).	do	Do.
6227	Lemonquat (lemon × kumquat).	do	Do.
6228 to 6231	Mandor		
6232 to 6246	Mandelo (mandarin × grapefruit).	do	Do.
6247 to 6250	Orangelo (orange × grapefruit).	do	Do.
6251 to 6256	Oranguma (orange × Satsuma).	do	Do.
6257	Soporin (sour pomelo × king of Siam).	do	Do.
6268	Do	do	Do.
6269 to 6274	Sopodia (sour pomelo × sour orange).	do	Do.
6275	Tangeruma (tangerine × Satsuma).	do	Do.
6276	Tangelorin (tangerine × grapefruit) × king of Siam.	do	Do.
6277	Do	do	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6278	Citrunshu (*Poncirus trifoliata* × Satsuma).	*Citrus* hybrid	Washington, D. C.
6279	Soporia (sour pomelo × king of Siam).	do	Do.
6280	Citrangor (citrange × orange).	do	Do.
6281	Citrangelo (citrange × grapefruit).	do	Do.
6282	Citrange (*Poncirus trifoliata* × orange).	do	Do.
6283	Citrumelo (*Poncirus trifoliata* × grapefruit).	do	Do.
6284	Citrange (*Poncirus trifoliata* × orange).	do	Do.
6291 to 6300	Citrangedin (citrange × calamondin).	do	Do.
6301	Citrangequat (citrange × kumquat).	do	Do.
6302	Do	do	Do.
6303	Citrangemon (citrange × lemon).	do	Do.
6304 to 6316	Citrangelo (citrange × grapefruit).	do	Do.
6317	Citremon (*Poncirus trifoliata* × lemon).	do	Do.
6318	Do	do	Do.
6319	Citrunshu (*Poncirus trifoliata* × Satsuma).	do	Do.
6320	Citremon (*Poncirus trifoliata* × lemon).	do	Do.
6321	Do	do	Do.
6322	Citrunshu (*Poncirus trifoliata* × Satsuma).	do	Do.
6323	Citremon (*Poncirus trifoliata* × lemon).	do	Do.
6351	Citrunshu (*Poncirus trifoliata* × Satsuma).	do	Do.
6352	Tangelorin (tangerine × grapefruit) × king of Siam.	do	Do.
6353	Citremon (*Poncirus trifoliata* × lemon).	do	Do.
6354	Citrangelo (citrange × grapefruit).	do	Do.
6355	Citraldin (*Poncirus trifoliata* × calamondin).	do	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6356	Citremon (*Poncirus trifoliata* × lemon).	*Citrus* hybrid	Washington, D. C.
6357	Citrangelo (citrange × grapefruit).	do.	Do.
6358	Clemelo (clementine orange × grapefruit).	do.	Do.
6359	Do	do.	Do.
6360	Do	do.	Do.
6361	Faustrimedin (Australian fingerlime × calamondin orange).	do.	Do.
6362	Do	do.	Do.
6363	Limedin (lime × calamondin orange).	do.	Do.
6364	Clemelo (clementine orange × grapefruit).	do.	Do.
6365	Do	do.	Do.
6366	Do	do.	Do.
6367	Faustrimedin (Australian fingerlime × calamondin orange).	do.	Do.
6368	Limelo (lime × grapefruit).	do.	Do.
6369	Faustrime (Australian finger lime × lime).	do.	Do.
6370	Faustrimedin (Australian finger lime × calamondin orange).	do.	Do.
6371 to 6390	Clemelo (clementine orange × grapefruit).	do.	Do.
6391	Tangelo (mandarin × pomelo).	do.	Do.
6392	Clemelo (clementine orange × grapefruit).	do.	Do.
6393	Tangelo (mandarin × pomelo).	do.	Do.
6394	Clemelo (clementine orange × grapefruit).	do.	Do.
6395 to 6420	Tangelo (mandarin × pomelo).	do.	Do.
6421	Siamelo (king of Siam × grapefruit).	do.	Do.
6422	Do	do.	Do.
6423	Tangelo (mandarin × pomelo).	do.	Do.
6424	Do	do.	Do.
6425	Orangelo (orange × grapefruit).	do.	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6426	Orangelo (orange × grapefruit).	*Citrus* hybrid	Washington, D. C.
6427	Siamelo (king of Siam × grapefruit).	do.	Do.
6428	Do	do.	Do.
6429	Orangelo (orange × grapefruit).	do.	Do.
6430	Siamelo (king of Siam × grapefruit).	do.	Do.
6431	Do	do.	Do.
6432	Orangelo (orange × grapefruit).	do.	Do.
6433	Do	do.	Do.
6434	Do	do.	Do.
6435	Siamelo (king of Siam × grapefruit).	do.	Do.
6436	Orangelo (orange × grapefruit).	do.	Do.
6437	Do	do.	Do.
6438	Do	do.	Do.
6439 to 6447	Oranguma (orange × Satsuma).	do.	Do.
6448 to 6451	Tangelolo (tangerine × grapefruit) × grapefruit.	do.	Do.
6452	Tangelorin (tangerine × grapefruit) × king of Siam.	do.	Do.
6453	Tangelolo (tangerine × grapefruit) × grapefruit.	do.	Do.
6454	Do	do.	Do.
6455	Tangelorin (tangerine × grapefruit) × king of Siam.	do.	Do.
6456	Tangelolo (tangerine × grapefruit) × grapefruit.	do.	Do.
6457	Do	do.	Do.
6458	Do	do.	Do.
6459	Tangelorin (tangerine × grapefruit) × king of Siam.	do.	Do.
6460	Orangelo (orange × grapefruit).	do.	Do.
6460	Tangelolo (orange × grapefruit).	do.	Do.
6462 to 6467	Satsumelo (Satsuma × grapefruit).	do.	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1917		
	Citrus hybrids—Continued.		
6468	Tangelorin (tangerine × grapefruit) × king of Siam.	*Citrus* hybrid	Washington, D. C.
6469	Satsumelo (Satsuma × grapefruit).	do	Do.
6470 to 6475	Tangelorin (tangerine × grapefruit) × king of Siam.	do	Do.
6476 to 6490	Satsumelo (Satsuma × grapefruit).	do	Do.
6491	Oranguma (orange × Satsuma).	do	Do.
6492	Do	do	Do.
6493	Satsumelo (Satsuma × grapefruit).	do	Do.
6494	Calashu (calamondin × Satsuma).	do	Do.
6495	Satsumelo (Satsuma × grapefruit).	do	Do.
6496 to 6503	Oranguma (orange × Satsuma).	do	Do.
	1918		
6590	Mandarin: Kiriki unshiu	*Citrus nobilis* Loureiro	Do.
	Citrus hybrids:		
6505 to 6513		*Citrus* hybrid	Little River, Florida.
6617 to 6626		do	Washington, D. C.
	Miscellaneous:		
6587	Ikeda	*Citrus* sp	Do.
6604		*Citrus trifoliata*	China.
	1919		
6570	Orange: Chukaa	*Citrus sinensis* Osbeck	Hongkong.
	Mandarins:		
6569	Pongkaa	*Citrus nobilis* Loureiro	Do.
6571	Sunkit	do	Do.
6946 to 6957	Citrus hybrids	*Citrus* hybrid	Washington, D. C.
	Citrus species:		
6995	Djeroek manis	*Citrus* sp	Java.
6996	Djeroek nipis	do	Do.
6997	Djeroek garoet	do	Do.

TABLE 1.—*Varieties of citrus trees introduced from foreign countries*—Continued.

P. I. No.	Year and kind.	Scientific name.	Origin.
	1920		
7217	Lemon: Rough lemon	*Citrus limonia* Osbeck	Florida, U. S.
7143	Lime: Othaheite lime	*Citrus aurantifolia* Swingle	Japan.
7229	Pomelo: Seedless pomelo	*Citrus maxima* Merrill	Calcutta, India.
7227	Mandarin: Sikkim	*Citrus nobilis* Loureiro	Do.
	Citrus species:		
7142	Matsu Mikan	*Citrus* sp	Japan.
7228	Butwal	do	Calcutta, India.
7288		do	Canton, China.
	Miscellaneous:		
7289	Citrus moi		Do.
7309		*Citrus trifoliata*	Japan.
	1921		
	Lemons:		
7531	Rough lemon	*Citrus limonia* Osbeck	Do.
7619	Eureka	do	California.
7693	Lemon	do	Washington, D. C.
7719	Lime: Thornless lime	*Citrus aurantifolia* Swingle	Soledad Cienfuegos, Cuba.
7541	Pomelo	*Citrus maxima* Merrill	Japan.
	Citrus hybrids:		
7786	Rusk citrange (*Poncirus trifoliata* × citrange).		Washington, D. C.
7787	Citrangequat (citrange × kumquat).		Do.
7788 7789			Do.
7242	Citrus species: Matsu Mikan	*Citrus* sp	Yokohama, Japan.
	1922		
8264	Lemon	*Citrus limonia* Osbeck	United States.
	1923		
	Mandarins:		
8315	Mandarin	*Citrus nobilis* Loureiro	Canton, China.
8316	Do	do	Do.

Table 2 gives the citrus fields containing the different kinds of citrus, most of which were imported, now growing at the Lamao Experiment Station. The dates of planting, flowering, and fruiting, the number of trees of each kind bearing, and the number of fruits harvested in 1923 are also included in the table. The names of some kinds imported and given in Table 1 are not included in Table 2, because the plants died shortly after arrival or were dead when received. Table 3 shows the citrus hybrids growing in Field N.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon.*

[Data from the Philippine Bureau of Agriculture.]

FIELD A

P. I. No.	Scientific and common name of scion.[a]	Stock.[b]	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus aurantifolia:									
901	Dayap	O	2	2	1912	Feb. 23; May 9, 1923.	Feb. 29; May 15, 1923.	2	2	27
902	Do	O	1	1	do.	do.	do.	1	1	16
1749	Lime	O	2	2	do.	do.	do.	2	2	150
2182	Do		1	2	do.	do.	do.	1	1	10
2882	Pati China	P and Cn			1922; 1923					
1708	Tahiti	Cn		2	Apr. 13, 1923					
	Citrus aurantium:									
1264	Sour orange	P and M	2	2	1916; 1918					
1638	Do	O	2	2	1912	Feb. 23, 1923	Feb. 29, 1923	2	2	215
1013	*Citrus excelsa:* Limon real (marcot)		2	1	July 13, 1922					
	Citrus limonia:									
7619	Eureka	So and M		2	do.					
7693	Lemon (seedling)		2	2	do.					
708	Lisbon	P and M	1	2	1915; 1923					
3675	Rough lemon (marcot)		2	2	July 13, 1922					
	Citrus maxima:									
1633	Case pomelo	O	2	2	1912	Feb. 23, 1923	Feb. 29, 1923	2	2	83
6005	Chinese pomelo	P	1	1	1920					
1333	Ellen	O	2	2	1912	Feb. 23, 1923	Feb. 28, 1923	2	2	5

[a] Scion is the part inserted in budding or grafting.

[b] Abbreviations and their meanings are as follows: A, alsem; Cm, *Citrus medica;* Cmac, *Citrus macrophylla;* Cn, calamondin; Csp, *Citrus* species; Cw, *Citrus webberi;* K, kabuyao; L, lemon; Le, lime; Lr, limon real; M, mandarin; O, sweet orange; P, pomelo; So, sour orange.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD A—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus maxima—Continued.									
2265	Lukban	O	2	1	1913	Feb. 23, 1923	Feb. 28, 1923	2	1	110
1707	Marsh	O	2	2	1912	do	do	1		
1631	Do	P	1	1	do	do	do	1	1	25
899	Oblong pomelo	O	1	1	do					
1334	Pernambuco	O and Csp	2	2	1912; 1916	Feb. 23, 1923	Feb. 28, 1923			
891	Pomelo	O	2	2	1912					
893	Do	O	1	1	do					
1713	Triumph	O	2	2	do	Feb. 23, 1923	Feb. 28, 1923	1	1	14
1632	Do	P	2	2	do	do	do	2	2	47
3392	Yugelar	P	1	1	1920					
	Citrus medica:									
	Cotabato	Cn		2	Apr. 11, 1923					
	Citrus medica	O	1	1	1913					
1716	Citron	O	1	2	1914	Feb. 23, 1923	Feb. 30, 1923	1	1	5
848	Murill	O	2	2	1912; 1913	Apr. 10, 1923	Apr. 16, 1923	2	2	6
	Yanzo (seedling)		2	2	June 15, 1921					
1718	*Citrus mitis:* Kalamondin	O	1	1	1912	Feb. 23, 1923	Feb. 28, 1923	1	1	165
6589	*Citrus miaray*	M	1	1	1920					
	Citrus nobilis:									
1265	China	Cw	1	1	1912	Apr. 29, 1923	May 5, 1923	1	1	2
1918	Dancy		1	1	1913					
1271	Kishiu	O	1	1	1912	Feb. 23, 1923	Feb. 28, 1923	1	1	35
1272	Konda narum	O and Cn	2	2	do					
1256	Ladu	Lr	1	1	1919					

1335	Oneco	O	4	3	1912; 1916	Feb. 23, 1923	Feb. 28, 1923	1	1	2
5143	Rafael	P	2	2	1921; 1922					
744	Tizon var. *papillaris*	O	1	1	1912					
	Do	Lr	2	2	1914; 1919					
	Citrus sinensis:									
1720	Bahia	O	1	1	1912	Feb. 23, 1923	Feb. 28, 1923	1	1	2
966	Cajel	O	2	2	do	do	do	2	2	7
1728	Cuyo	O	2	2	do	do	do	2	2	17
1260	Excelsior	O	1	2	1912; 1923	Feb. 23; May 29	Feb. 28; June 6	1	1	8
2685	Everbearing	Cw	2	2	1916					
1701	Holdfast	O	2	2	1912	Feb. 23, 1923	Feb. 28, 1923	2	2	12
56	Jaffa	O	1	1	do	do	do	1	1	23
1719	Do	O	2	2	do	do	do	2	2	7
1637	Do	O	2	2	do	do	do	2	2	11
1714	Larrantta	O	1	1	do	do	do	1	1	16
1705	Mediterranean [c]	O and Lr	2	2	do	do	do	2	1	76
1743	Do	Cw	1	2	1912; 1923					
1742	Navalencia	M	1	1	1912					
2365	Orange	K	1	1	do	Feb. 23, 1923	Feb. 28, 1923	1	1	1
1635	Pineapple	O and Cn	1	2	1912; 1923	do	do	1	1	116
1639	Ruby	O	2	2	1912	do	do	2	2	106
2114	Sawyer's navel	P	1	1	1918					
1277	Seville	O	1	2	1912; 1923	Feb. 23, 1923	Feb. 28, 1923	1	1	
1270	St. Michael	O	2	2	1912	do	do	2	2	330
1706	Valencia	O	2	2	do	do	do	2	2	24
51	Do	Cn and O	4	4	1917; 1912	do	do	3	3	12
1636	Washington navel	O and Cn	1	2	1912; 1923	do	do	1	1	14
1711	Do	O	1	1	1915					
1715	White siletta	O	2	2	1912	Feb. 23, 1923	Feb. 28, 1923	2	2	20
2049	*Citrus southwickii*	Cm	2	2	1913	do	do	2	2	

[c] One tree carried away by flood.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD A—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus sp.:									
2264	Tambuyog	K	1	1	1919					
6539	Duroga	M	1	1	do					
	Citrus hybrid:									
1948	Sampson tangelo (tangerine × pomelo)		1	2	1913					
1618	Do	P	2	2	do	Feb. 23, 1923	Feb. 28, 1923	2	2	12
	Citrus webberi:									
853	Alsem	O and Lr	2	2	do	do	do	2	2	
896	Kabugau, *Citrus webberi* var. *montana*	O	2	2	1912	do	do	2	2	28
2266	Do	O	1	2	1913	do	do	1	1	300

FIELD B

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees. 1922	Growing trees. 1923	Planted.	Flowered.	Fruited.	Trees bearing fruit. 1922	Trees bearing fruit. 1923	Fruits harvested, 1923
	Citrus aurantifolia:									
3670	Trinidad	Cn	2	2	1914	Feb. 23, 1923	Feb. 28, 1923	2	2	730
3669	Everglade	Cn	2	2	do	do	do	2	2	777
	Citrus aurantium:									
2511	Florida	O	2	2	1915	do	do	1	1	10
2662	Sour orange	P	2	2	do	do	do	2	2	105
2385	Do		2	2	do	do	do	2	2	116
	Citrus excelsa:									
1009	Limon real (stock)		1	1	do	do	do	1	1	
3888	Le Nestour	Lr	1	1	do	do	do	1	1	5

	Citrus hystrix:								
3665	Kolobot, *Citrus hystrix* var. *torosa*	P	2	2	1918	do.	do.	1	1	8
3668	*Citrus hystrix* D. C	Cn	1	1	1915	do.	do.	1	1	
3656	Kanci, *Citrus hystrix* var. *boholensis*	Lr	1	1	do.	do.	do.	1	1	
	Citrus limonia:									
7693	Lemon (seedling)		2	2	July 12, 1922					
3675	Rough lemon		2	2	July 13, 1922					
	Citrus maxima:									
	Chinese pomelo		1	1	1921					
2687	Duncan	P	2	2	1915	Feb. 23, 1923	Feb. 28, 1923	1	1	86
2690	Marsh		1	1	do.					
2700	McCarthy	P	1	1	do.					
3882	Do	So	2	2	do.	Feb. 23, 1923	Feb. 28, 1923	2	2	42
4121	Do	Cw	2	2	do.	do.	do.	2	2	63
6181	Native pomelo	P	2	2	1916					
2524	Pomelo	P	1	1	1915	Feb. 23, 1923	Feb. 28, 1923	1	1	14
4125	Royal	Cmac.	2	2	do.	do.	do.	2	2	4
3384	Saigon	P	2	2	do.	do.	do.	2	2	18
1995	Siamese	P	2	2	do.	do.	do.	1	1	14
3389	Do	P	1	1	1919					
3673	S. S. pomelo	O	1	1	1915	Feb. 23, 1923	Feb. 28, 1923	1	1	58
4118	Walter	So and O	2	2	do.	do.	do.	2	2	58
	S. S. pomelo	P	2	2	1917			1	1	1
3392	Yugelar	P	1	1	1915					
3391	Do	P	1	1	do.	Feb. 23, 1923	Feb. 28, 1923	1	1	1
7541	*Citrus maxima*		3	3	July 13, 1922					
2502	*Citrus micrantha:* Biasong	O	1	1	1915	Feb. 23; May 29	Feb. 28; May 6	1	1	300
	Citrus mitis:									
2355	Kalamondin	P	1	1	do.	do.	do.	1	1	530
2513	Do	Lr and Cn	2	2	do.	do.	do.	2	2	2,830
2332	Do	Lr	2	2	do.	do.	do.	2	2	548

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD B—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus nobilis:									
2693	King	P	2	2	1915	Feb. 23, 1923	Feb. 29, 1923	2	2	15
5173	Saagkam	Cn	2	2	1917	do	do	1	1	5
3383	*Citrus nobilis*	Lr	1	1	1915	do	do	1	1	15
	Citrus sinensis:									
3660	Balanga	Cn	2	2	do	Feb. 23; May 29	May 29; June 6	2	2	148
2698	Boone	Cn	1	2	do	Feb. 23, 1923	Feb. 29, 1923	1	1	30
4117	Brown	O	2	2	do	do	do	2	2	41
2695	Do	Lr	2	2	do	Feb. 23, May 29	do	2	2	212
4124	Carleton	O	2	2	do	Feb. 23, 1923	do	2	2	140
4119	Dugat	Cw and Le	2	2	do	Feb. 23; May 29	May 29; June 6	2	2	57
3886	Du Roi	So	1	1	do	Feb. 23, 1923	Feb. 29, 1923	1	1	5
2689	Enterprise		1	2	do	Feb. 23; May 29	do	1	1	8
1259	Malta Blood [d]	Lr	1	1	do	Feb. 23, 1923	do	1	1	147
2697	Maltese Blood	P	1	1	do	Feb. 23; May 29	do	1	1	3
2694	Majorca	Lr	1	2	do	do	do	1	2	63
2568	Misamis	Lr	1	1	do	do	do	1	1	110
4123	Magnum bonum	O	2	2	do	Feb. 23, 1923	do	2	2	122
2563	Native orange	Lr	1	1	do	do	do	1	1	
2686	Pineapple	Cn	1	1	do	Feb. 23; May 29	do	1	1	104
5177	Pongkan	M	2	2	1917	Feb. 23, 1923	do	2	2	84
2569	Valencia	Cn	1	1	1913					
2426	*Citrus sinensis*		1	1	1915					
1948	*Citrus* hybrid: Sampson tangelo (tangerine × pomelo).	P	1	1	do					

	Citrus medica:									
	Yanzo (seedling)		2	2	June 15, 1921					
1716	Citron (marcot)		2	2	July 13, 1922					
3671	*Citrus* sp.	Cn	1	1	1915	Feb. 23, 1923	Feb. 29, 1923	1	1	5
	FIELD C.									
	Citrus aurantifolia:									
5163	Tahiti	O	2	2	1917	Feb. 23, 1923	Feb. 28, 1923	2	2	15
5176	Lime	P and Cn	2	2	1915	do	do	2	2	15
4827	Lombog	P	1	1	do	do	do	1	1	28
5184	Kusaie lime	P	1	1	1918					
2662	*Citrus aurantium:* Sour orange	P	2	2	1915	Feb. 23, 1923	Feb. 28, 1923	2	2	25
3841	*Citrus excelsa:* Tanchau	P	1	1	do	do	do	1	1	0
	Citrus limonia:									
4804	Lemon	P	1	1	1918	do	do			
5175	Do	C	2	2	1915	do	do	2	2	6
	Citrus hystrix:									
4830	Amontay	P	1	1	do					
2494	Kabuyau	O	1	1	do	Feb. 23, 1923	Feb. 28, 1923	1	1	6
5189	Do	P	1	1	1918	do	do	1	1	13
4214	Kamugau	Lr	1	1	1915	do	do	1	1	
4225	Kalooy	Lr	2	2	do	do	do	2	2	36
4824	Kanci, *Citrus hystrix* var. *boholensis*	P	1	1	do	do	do	1	1	
5137	Kolobot, *Citrus hystrix* var. *torosa*	P	2	2	do	do	do	2	2	8
5165	Suangui, *Citrus hystrix* var. *torosa*	Cw	2	2	1917	Feb. 23; May 29	Feb. 28; June 6	2	2	64
	Citrus medica:									
4739	Citron	So	1	1	1915	May 29, 1923	June 6, 1923	1	1	
	Cidra	Cw	1	2	1915; 1923					
4839	*Citrus longispina:* Tamisan	P	2	2	1915	Feb. 23, 1923	Feb. 28, 1923		1	

[d] Carried away by flood.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD C—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus maxima:									
2503	Boongon	O	1	1	1915					
4868	Kellogg	P	2	2	do.	Feb. 23, 1923	Feb. 28, 1923	2	2	16
3876	Nakoin	P	1	1	do.					
5103	Panuban	P	2	2	1918					
5144	Do	P	1	1	1915	Feb. 23, 1923	Feb. 28, 1923	1	1	3
5146	Do	P	1	1	do.					
5223	Pomelo	P	2	2	1917					
3442	Siamese	So	1	1	1915	May 29, 1923	June 6, 1923	1	1	
	Citrus mitis: Kalamondin		2	2	do.	Feb. 23, 1923	Feb. 28, 1923	2	2	1,144
	Citrus nobilis:									
1256	Ladu	P	1	1	do.					
5142	Laurel	P	2	1	1919					
5138	Malvar	Cw	2	2	1915					
2948	Mandarin	P and M	2	2	1917					
744	Molana, *Citrus nobilis* var. *molana*	Cn	1	1	1915					
3883	Oneco	Cw	2	2	1915; 1919					
1262	Suntara	P	2	2	1915					
745	Tizon, *Citrus nobilis* var. *papillaris* [d]	Lr	1	1	1918					8
5139	Ubay	P	2	2	do.					
	Citrus sinensis:									
4126	Foster	O	2	2	1915	Feb. 23, 1923	Feb. 28, 1923			46
1258	Jaffa	O	2	2	do.	do.	do.			19
5188	Orange	P	2	2	1917					
1266	Whitaker	P and Cn	2	2	1915	Feb. 23, 1923	Feb. 28, 1923	2	2	16

3885	*Citrus* hybrid: Sampson tangelo (tangerine × pomelo).	P	2	2	do					
5325	*Citrus* sp	P	1	1	1917					
	Citrus webberi:									
5147	Alsem	P	1	2	1915					
5174	Kabugau, *Citrus webberi* var. *montana*	P	1	2	1918					
5497	Gauid, *Citrus webberi* var. *montana*	P	1	2	do					
5540	Lurad	P	2	2	do					
5102	*Citrus webberi*	P	2	2	do	Feb. 23, 1923	Feb. 28, 1923	2	2	24
	Citrus aurantifolia:									
741	Lime [e]		3	1	1913			3	1	
2500	Do		1		do			1		
3672	Do [f]		4	3	do			4	3	
2532	Do [e]		4	2	do			4	2	
975	Do		2	2	do					
2346	Do [f]		4	3	do			4	3	
901	Do		4	4	1914				2	
2190	Do [f]		4	3	do			1	1	
1400	Do		3	3	do					
	Citrus aurantium:									
1453	*Citrus aurantium*		4	4	1913					
1011	Do		4	4	do					
2357	Do		6	6	do			6	6	
1593	Do		4	4	1914			2	2	
7448	Do		3	3	do					
	Citrus excelsa:									
853	*Citrus excelsa*		3	3	1913					
741	Do [e]		6	4	do					
1009	Do [g]		2	2	do					

[d] Carried away by flood.

[e] Two died of bark rot.

[f] One died of bark rot.

[g] Died of bark rot.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD C—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus hystrix:									
790	*Citrus hystrix*		4	4	1913			4	4	
834	Do		5	5	do			2	2	
807	Do[f]		9	8	do					
5129	Do		2	2	do					
3673	Do		5	5	do					
	Citrus limonia:									
	Rough lemon		5	5	do	Feb. 23, 1923	Feb. 28, 1923	1	1	20
1754	*Citrus limonia*[e]		3	1	1915					
	Citrus longispina:									
2529	*Citrus longispina*		5	5	1913					
2528	Do		7	7	do					
	Citrus maxima:									
897	*Citrus maxima*		1	1	do					
5699	Do		2	2	do					
750	Do		3	3	do					
2461	Do		4	4	do					
3673	Do		1	1	do					
7421	Do		2	2	do					
2403	Do		4	4	1914					
1646	Do		2	2	do					
2372	*Citrus macrophylla*		4	4	1913					
	Citrus micrantha:									
	Citrus micrantha		1	1	do					
2502	Do		2	2	do					
1892	Do		4	3	1914					

	Citrus mitis:									
741	Kalamondin		2	2	1913	Oct. 16, 1922	Oct. 21, 1922	2	2	75
772	Do		4	4	do	Mar. 23, 1923	Mar. 28, 1923	4	4	2,350
2653	Do		4	4	1914	do	do	4	4	55
2651	Do		4	4	do	do	do	4	4	120
	Citrus medica:									
27	*Citrus medica*		1		1913					
790	Do		2	2	do					
5699	Do		1	1	do					
2499	Do		2	2	do					
2652	Do		1	1	1914					
	Citrus sinensis:									
706	Bahia		2	2	1913					
1260	Excelsior		1	1	do					
1258	Jaffa		1	1	do					
1259	Malta Blood		1	1	do	Feb. 23, 1923	Feb. 28, 1923	1	3	147
1743	Mediterranean		1	1	do					
1742	Navalencia		2	2	do	Feb. 23, 1923	Feb. 28, 1923	2	2	
740	Orange		4	4						
2344	Do		4	4						
2648	Do		4	4	1914					
2649	Do		4	4	do					
1636	Washington navel		2	2	1913					14
	Citrus southwickii:									
2526	Limau		4	4	do					
2517	Do[f]		4	3	do	Feb. 23, 1923	Feb. 28, 1923	1		
2525	Do		6	6	do					
	Citrus webberi:									
	Citrus webberi		3	3	do	Feb. 23, 1923	Feb. 28, 1923	3	3	
789	Do		4	4	do	do	do	4	4	
2275	Do		4	4	do	do	do	4	4	
2363	Do		4	4	do	do	do	4	4	

[e] Two died of bark rot.

[f] One died of bark rot.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD C—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus nobilis:									
1265	China		1	1	1913					2
1271	Kishiu		2	2	do.					35
1256	Ladu		2	2	do.					
1263	Sikkim		1	1	do.					
1262	Suntara		2	2	do.					
1267	Szinkom		2	2	do.	Feb. 23, 1923	Feb. 28, 1923	2	2	
2527	*Citrus nobilis*		4	4	do.					
	Do		4	4	do.					
5975	Do		1	1	do.					
2469	Do		4	4	do.					
2346	Do		4	4	do.					
2650	Do		4	4	1914					
2448	Do		4	4	do.					
1647	Do		4	4	do.					
	FIELD N.									
2346	*Citrus aurantifolia*		1	1	do.					
	Citrus aurantium:									
1453	*Citrus aurantium*		1	1	do.	Feb. 23, 1923	Feb. 28, 1923	1	1	
1448	Do		2	2	do.	do.	do.	2	2	
969	Do		8	8	do.	do.	do.	8	8	
920	Do		2	2	do.	do.	do.	2	2	

	Citrus excelsa:									
2655	*Citrus excelsa*		4	4	do	do	do	2	2	
970	Do[f]		4	3	do	do	do	3	3	
1013	Do		3	3	do	do	do	3	3	
833	Do		4	4	do	do	do	4	4	2
853	Do		2	2	do					
	Citrus hystrix:									
	Citrus hystrix		2	2	do					
5699	Do		1	1	do					
790	Do		1	1	do					
834	Do		4	4	do			2	2	
	Citrus maxima:									
2257	*Citrus maxima*		2	2	do					
990	Do		2	2	1915					
2402	Do		4	4	do					
560	Do		1	1	do					
549	Do		1	1	do					
3035	Do		4	4	1917					
	Citrus medica:									
5699	*Citrus medica*		2	1	1914					
897	Do		1	1	do					
1010	Do		3	3	do					
840	Do		1	1	do					
	Do		1	1	do					
	Citrus mitis:									
2653	*Citrus mitis*		1	1	do	October 15, 1922; Mar. 23, 1923.	October 21, 1922; Mar. 28, 1923.	1	1	50
2184	Do		4	4	do	do	do	4	4	210
	Citrus nobilis:									
2527	*Citrus nobilis*		2	2	do					
2346	Do		3	3	do					

[f] One died of bark rot.

TABLE 2.—*Citrus fields at Lamao Experiment Station, Bataan Province, Luzon*—Continued.

FIELD N—Continued.

P. I. No.	Scientific and common name of scion.	Stock.	Growing trees.		Planted.	Flowered.	Fruited.	Trees bearing fruit.		Fruits harvested, 1923
			1922	1923				1922	1923	
	Citrus nobilis—Continued.									
2469	*Citrus nobilis*		1	1	1914					
2448	Do		8	8	do.					
	Citrus sinensis:									
	Citrus sinensis		3	3	do.					
923	Do		4	4	do.					
1982	*Citrus* sp		4	4	do.					
	Citrus webberi:									
2363	*Citrus webberi*		3	3	do.	Feb. 23, 1923	Feb. 28, 1923	3	3	
789	Do		4	4	do.	do.	do.	3	3	
2275	Do		3	3	do.	do.	do.	3	3	
5698	Do		5	5	do.	do.	do.	5	5	
5102	Do		5	5	do.	do.	do.	4	4	
892	Do		3	3	do.	do.	do.	3	3	

TABLE 3.—*Citrus hybrids in field N, Lamao Experiment Station.*

P. I. No.	Scientific and common name.	Stock.	Trees.		Year planted.
			1922	1923	
5550	*Citrus* hybrid	Pomelo	1	1	1917
5553	Do	do	1	1	1917
5555	Do	do	1	1	1917
5556	Do	do	1	1	1917
5557	Do	do	1	1	1917
5558	Do	do	1	1	1917
5561	Do	do	1	1	1917
5562	Do	do	1	1	1917
5565	Do	do	1	1	1917
5566	Do	do	1	1	1917
5567	Do	do	1	1	1917
5568	Do	do	1	1	1917
5569	Do	do	1	1	1917
5571	Do	do	1	1	1917
5572	Do	do	1	1	1917
5573	Do	do	1	1	1917
5574	Do	do	1	1	1917
5575	Do	do	1	1	1917
5578	Do	do	1	1	1917
5579	Do	do	1	1	1917
5580	Do	do	1	1	1917
5581	Do	do	1	1	1917
5582	Do	do	1	1	1917
5583	Do	do	1	1	1917
5584	Do	do	1	1	1917
5585	Do	do	1	1	1917
5586	Do	do	1	1	1917
5587	Do	do	1	1	1917
5588	Do	do	1	1	1917
5589	Do	do	1	1	1917
5590	Do	do	1	1	1917
5591	Do	do	1	1	1917
5592	Do	do	1	1	1917
5593	Do	do	1	1	1917
5594	Do	do	1	1	1917
5598	Do	do	1	1	1917
5599	Do	do	1	1	1917
5651	Do	do	1	1	1917
5663	Do	do	1	1	1917
6353	Clemelo (Clementine orange × grapefruit)	do	1	1	1915
5654	*Citrus* hybrid	do	1	1	1917
5655	Do	do	1	1	1917
5656	Do	do	1	1	1917
5657	Do	do	1	1	1917
5658	Do	do	1	1	1917
5662	Do	do	1	1	1917
5663	Do	do	1	1	1917
6376	Clemelo (Clementine orange × grapefruit)	do	1	1	1918
6375	Do	do	1	1	1918
5705	*Citrus* hybrid	do	1	1	1917
5706	Clemelo (Clementine orange × grapefruit)	do	1	1	1917

TABLE 3.—*Citrus hybrids in field N, Lamao Experiment Station*—Ctd.

P. I. No.	Scientific and common name.	Stock.	Trees.		Year planted.
			1922	1923	
5707	*Citrus* hybrid	Pomelo	1	1	1917
5709	Do	do	1	1	1917
6369	Faustremon (Australian finger lime × lime)	do	1	1	1918
6404	Tangelo (tangerine × pomelo)	do	1	1	1918
5712	*Citrus* hybrid	do	1	1	1917
6364	Clemelo (Clementine orange × grapefruit)	do	1	1	1918
6378	Do	do	1	1	1918
6716	*Citrus* hybrid	do	1	1	1917
6311	Citrangelo (citrange × grapefruit)	do	1	1	1918
6391	Tangelo (tangerine × pomelo)		1	1	1918
5720	*Citrus* hybrid	Pomelo	1	1	1917
5721	Do	do	1	1	1917
6774	Do	do	1	1	1918
5728	Do	do	1	1	1917
6397	Do	do	1	1	1918
6385	Tangelo (tangerine × pomelo)	do	1	1	1918
5734	*Citrus* hybrid	do	1	1	1917
5737	Do	do	1	1	1917
6356	Citremon (*Poncirus trifoliata* × lemon)	do	1	1	1918
6411	Tangelo (tangerine × pomelo)	do	1	1	1918
5759	*Citrus* hybrid	do	1	1	1917
	Do		1	1	1917
5741	Do		1	1	1917
5744	Do		1	1	1917
5746	Do		1	1	1917
6451	Tangelo (tangerine × pomelo)	Pomelo	1	1	1918
6389	Clemelo (Clementine orange × grapefruit)	do	1	1	1918
5748	*Citrus* hybrid		1	1	1917
5755	Do		1	1	1917
5756	Do		1	1	1917
5757	Do		1	1	1917
5758	Do		1	1	1917
6320	Citremon (*Poncirus trifoliata* × lemon)	Pomelo	1	1	1918
6388	Clemelo (Clementine orange × grapefruit)	do	1	1	1918
6442	Oranguma (orange × Satsuma)	do	1	1	1918
6407	Tangelo (tangerine × pomelo)	do	1	1	1918
5770	*Citrus* hybrid	do	1	1	1917
5771	Do		1	1	1917
6317	Citremon (*Poncirus trifoliata* × lemon)	Pomelo	1	1	1917
5772	*Citrus* hybrid		1	1	1917
5773	Do		1	1	1917
5774	Do		1	1	1917
6408	Tangelo (tangerine × pomelo)	Pomelo	1	1	1918
5777	*Citrus* hybrid		1	1	1917
5778	Do		1	1	1917
5779	Do		1	1	1917
6423	Tangelo (tangerine × pomelo)	Pomelo	1	1	1918
5783	*Citrus* hybrid		1	1	1917
5784	Do		1	1	1917
5786	Do		1	1	1917
6787	Do		1	1	1918

TABLE 3.—*Citrus hybrids in field N, Lamao Experiment Station*—Ctd.

P. I. No.	Scientific and common name.	Stock.	Trees.		Year planted.
			1922	1923	
5790	*Citrus* hybrid		1	1	1918
6087	Citrandarin (*Poncirus trifoliata* × mandarin)		1	1	1918
6130	*Citrus* hybrid		1	1	1918
6110	Do		1	1	1918
6100	Citrumelo (*Poncirus trifoliata* × grapefruit)		1	1	1918
6111	*Citrus* hybrid		1	1	1918
6112	Do		1	1	1918
6113	Swingle's citrange (*Poncirus trifoliata*) × orange		1	1	1918
6082	Citradia (*Poncirus trifoliata* × sour orange)		1	1	1918
6088	Citrandarin (*Poncirus trifoliata* × mandarin)		1	1	1918
6108	Citrange (*Poncirus trifoliata* × orange)		1	1	1918
6075	Citradia (*Poncirus trifoliata* × sour orange)		1	1	1918
6099	Citrumelo (*Poncirus trifoliata* × grapefruit)		1	1	1918
6101	Do		1	1	1918
5956	*Citrus* hybrid	Mandarin	1	1	1918
5957	Do	do	1	1	1918
6136	Do		1	1	1918
6036	Citrandarin (*Poncirus trifoliata* × mandarin)		1	1	1918
6089	Do		1	1	1918
5947	*Citrus* hybrid	Pomelo	1	1	[a] 1918
5955	Do	do	1	1	[a] 1918
5948	Do	Mandarin	1	1	1918
6104	Citrunshu (*Poncirus trifoliata* × Satsuma)		1	1	1918
5961	*Citrus* hybrid	Mandarin	1	1	1918
5970	Do	do	1	1	1918
5922	Do	do	1	1	1918
5926	Do	do	1	1	1918
6078	Citradia (*Poncirus trifoliata* × sour orange)	do	1	1	1918
5918	*Citrus* hybrid	do	1	1	1918
5916	Do	do	1	1	1918
5965	Do	do	1	1	1918
5917	Do	do	1	1	1918
5553	Do	Pomelo	1	1	1918
5924	Do	Mandarin	1	1	1918
5937	Do	do	1	1	1918
5935	Do	do	1	1	1918
5954	Do	do	1	1	1918
5915	Do	do	1	1	1918
5909	Do	do	1	1	1918
5932	Do	do	1	1	1918
5946	Do	do	1	1	1918
5938	Do	do	1	1	1918
5930	Do	do	1	1	1918
5951	Do	do	1	1	1918
5913	Do	do	1	1	1918
5896	Do	do	1	1	1918
5903	Do	do	1	1	1918
5908	Do	do	1	1	1918
5897	Do	do	1	1	1918
5899	Do	do	1	1	1918

[a] May 25.

TABLE 3.—*Citrus hybrids in field N, Lamao Experiment Station*—Ctd.

P. I. No.	Scientific and common name.	Stock.	Trees.		Year planted.
			1922	1923	
5900	*Citrus* hybrid	Mandarin	1	1	1918
5952	Do.	do.	1	1	1918
5995	Do.	do.	1	1	1918
5914	Do.	do.	1	1	
5910	Do.	do.	1	1	
5912	Do.	do.	1	1	
5906	Do.	do.	1	1	
5904	Do.	do.	1	1	
5905	Do.	do.	1	1	
5881	Do.	Pomelo	1	1	
5885	Do.	do.	1	1	
5883	Do.	do.	1	1	1918
5890	Do.				
5884	Do.				
5880	Do.				
5655	Do.				
5889	Do.				
5892	Do.				
5657	Do.				
5886	Do.				
5893	Do.				
[b] 5950	Do.		1	1	
5998	Do.				
5991	Do.				
5994	Do.				
5894	Do.				
5925	Do.	Mandarin	1	1	1918
5859	Do.	Pomelo	1	1	1918
5865	Do.				
5659	Do.				
[c] 5881	Do.				
5870	Do.				
5672	Do.				
5852	Do.	Pomelo	1	1	1918
5856	Do.	do.	1	1	1918
5855	Do.	do.	1	1	1918
5858	Do.	do.	1	1	1918
5873	Do.	do.	1	1	1918
5869	Do.	do.	1	1	1918
5876	Do.	do.	1	1	1918
5862	Do.	do.	1	1	1918
5871	Do.	do.	1	1	1918
5875	Do.	do.	1	1	1918

[b] Died of pink disease.

[c] Died of bark rot.

It is remarkable that of 847 trees growing at the Lamao Experiment Station at the beginning of the year 1923 only 19 died; 3 of them were carried away by flood and 16 were destroyed by disease. Although many of the imported kinds are susceptible to disease, with proper cultivation and care disease does not gain a strong foothold.

It has been observed[2] that different species of citrus have different degrees of susceptibility to various citrus diseases, and that even the different varieties of the same species vary in susceptibility. All but one of the varieties of *Citrus aurantifolia* were attacked by canker, and this disease was prevalent throughout the year. All except one of the varieties were attacked by bark rot, which was prevalent during the latter part of the dry season only. There was only one case of pink disease, and it occurred during the rainy season.

The varieties under *C. aurantium* were not attacked by pink disease or by bark rot, although one variety was slightly affected by the latter toward the close of the dry season. This variety was also more or less resistant to canker. No case of foot rot was observed, but mottled leaf was prevalent the year round.

Citrus excelsa was attacked by bark rot and by canker. Bark rot was observed during the latter part of the dry season, and canker was prevalent throughout the year. This species was not attacked by pink disease, foot rot, or mottled leaf; at least, no case was observed.

Citrus hybrids were not attacked by bark rot. Their resistance to canker varied; some were greatly affected and others but slightly, and two varieties were immune to it. Nine cases of pink disease were observed during the latter part of the rainy season and the early part of the dry season; three trees were killed by it.

The different varieties of *C. hystrix* were generally not attacked by bark rot. They were more or less resistant to canker. There was not a single case of pink disease or foot root. There were four cases of mottled leaf, which were observed during the latter part of the dry season.

Citrus limonia was more or less attacked by bark rot and canker. Bark rot prevailed during the latter part of the dry season and canker prevailed throughout the year. This species was resistant to pink disease. There was only one case of mottled leaf.

Citrus longispina was attacked by pink disease, by canker, and by foot rot. It was more or less resistant to mottled leaf.

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[2] Annual Report of the Superintendent of Lamao Experiment Station to the Director of Agriculture for 1923.

Citrus maxima was more or less resistant to bark rot, but was attacked by canker; all of the varieties were affected throughout the year. It was also attacked by mottled leaf. There was only one case of pink disease.

Citrus medica was attacked by bark rot, more or less resistant to canker, and very resistant to pink disease, foot rot, and mottled leaf. Only one tree died of bark rot.

Citrus mitis was not attacked by pink disease, canker, or foot rot, and was somewhat resistant to bark rot. There were only one case of bark rot and two cases of mottled leaf.

Citrus nobilis was not attacked by pink disease or canker, was more or less resistant to bark rot, and was slightly attacked by mottled leaf and by foot rot. Only one case of foot rot and one of bark rot occurred.

Citrus sinensis was generally attacked by canker and by mottled leaf. There were three cases of pink disease and one case of foot rot. There were a few cases of mottled leaf of varying degrees during the latter part of the dry season.

Pink disease, foot rot, and mottled leaf did not affect any of the varieties of *Citrus southwickii.* They were not attacked by bark rot or canker.

The varieties of *Citrus webberi* were not attacked by foot rot or pink disease, and were more or less resistant to bark rot and canker. There were mottled leaf cases of slight degree throughout the year.

Aside from the diseases mentioned, there are several insect enemies which do considerable damage to Philippine citrus trees.

Mr. W. Schultze, entomologist of the Bureau of Science, considers that *Agrilus occipitalis* Eschscholtz, of the family Buprestidæ, is the insect most destructive to many species of citrus. The larvæ of this Coleoptera feed inside of the branches of the trees, which die as a result of the injuries. The larvæ of certain Lepidoptera, or butterflies, for example, *Papilio alphenor* Cramer and *Papilio rumanzovia* Eschscholtz, also feed on citrus, and sometimes do considerable damage, particularly to the young plants. Another destructive insect is a fly (probably the mango fruit fly, *Dacus ferrugineus*), which lays its eggs in the fruits; the larvæ feed on the flesh of the fruits, thus causing the latter to fall. The best remedy known is to gather the fallen fruits and bury them before the adult insects emerge in order to avoid the infection of other fruits. Still other enemies are the mealy bugs and the scale insects; a kerosene-emulsion spray is effective for checking these.

Table 4 shows production of the bearing citrus trees; that is, the actual yield of fruits per tree, the amount harvested, the number and calculated percentage of fruits dropping, and the age of each tree. The trees are grouped as to species and are arranged as to yield. In several tables and in the text the expression P. I. No. is used. This signifies the number given by the Bureau of Agriculture whenever a new plant is introduced.

TABLE 4.—*Production of bearing citrus trees at Lamao Experiment Station.*

P. I. No.	Row and tree Nos.	Scientific and common name.	Age.	Actual yield in fruits.		Fruits dropped.		Unaccountable losses.
				On tree.	Harvested.			
		Citrus aurantifolia:	*Yrs.*			*Number.*	*Per cent.*	
3669	R9 - T3	Everglade	8	712	670	42	5.89	
3670	R8 - T8	Trinidad	8	512	490	22	4.29	
3670	R8 - T7	Do	8	267	240	27	10.11	
1749	R8 - T8	Lime	11	178	150	26	14.60	2
3669	R9 - T4	Everglade	8	117	107	10	8.54	
1749	R8 - T7	Lime	11	59	50	9	15.25	
5176	R8 - T3	Do	8	30	12	18	60.00	
902	R17-T10	Dayap	11	24	16	5	20.83	3
901	R17- T9	Do	11	23	15	4	17.39	4
5163	R4 - T3	Tahiti	6	18	10	8	44.44	
901	R17- T8	Dayap	11	15	12	3	20.00	
2182	R6 -T13	Lime	10	15	10	5	33.33	
5163	R4 - T4	Tahiti	6	9	5	4	44.44	
5176	R8 - T4	Lime	8	6	3	3	50.00	
		Citrus aurantium:						
1638	R11- T2	Sour orange	11	220	120	7	3.09	99
1338	R11- T1	Do	11	210	95	10	4.76	105
2385	R7 - T3	Do	8	140	86	50	35.71	4
2662	R1 - T3	Do	8	130	90	40	30.76	
2662	R3 - T6	Do	8	104	75	29	27.88	
2385	R7 - T4	Do	8	99	30	20	20.20	49
2662	R3 - T5	Do	8	49	30	19	38.77	
2662	R1 - T2	Do	8	35	15	20	57.14	
2511	R2 - T4	Do	8	18	10	8	44.44	
2511	R2 - T3	Do	8	------	------	-------	-------	
1264	R6 - T1	Do	7	------	------	-------	-------	
		Citrus hystrix:						
5165	R5 - T9	Suangui	6	120	28	50	41.66	42
3668	R8 - T3	*Citrus hystrix*	8	86	0	86	100	
5165	R5 -T10	Suangui	6	66	36	20	30.30	10
3656	R9 - T4	Kanci, var. *boholensis*	8	65	0	65	100	
4225	R6 - T4	Kalo-oy	8	51	26	25	49.01	
4824	R8 - T1	Kanci, var. *boholensis*	8	36	0	36	100	
4225	R6 - T3	Kalo-oy	8	30	10	20	66.66	
5137	R11-T12	Kolobot, var. *torosa*	8	25	6	10	40.00	
2049	R6 - T8	*Citrus hystrix*	10	23	0	23	100	
5189	R14- T6	Kabuyau	6	16	13	3	18.75	
2494	R2 - T7	Do	8	15	0	15	100	
4214	R6 - T4	Kamugau	8	14	0	14	100	

TABLE 4.—*Production of bearing citrus trees at Lamao Experiment Station*—Continued.

P. I. No.	Row and tree Nos.	Scientific and common name.	Age.	Actual yield in fruits.		Fruits dropped.		Unaccountable losses.
				On tree.	Harvested.			
		Citrus hystrix:	*Yrs.*			*Number.*	*Per cent.*	
5137	R11–T11	Kolobot, var. *torosa*	8	12	2	5	41.66	5
2049	R6 – T7	*Citrus hystrix*	10	10	0	10	100	
3665	R4 –T12	Kolobot, var. *torosa*	5	8	0	8	100	
3665	R4 –T11	Do	5	----	----	----	----	
		Citrus maxima:						
4830	R9 – T3	Amontay	8	----	----	----	----	
2665	R5 – T4	Lukban	10	138	110	8	5.79	20
2687	R6 – T1	Duncan	8	123	86	20	16.26	17
4118	R10– T2	Walter	8	96	55	41	42.70	
1631	R11– T4	Marsh	11	90	25	65	72.22	
3882	R7 –T10	McCarthy	8	88	39	49	55.68	
4121	R10– T8	Do	8	64	41	23	35.93	
1633	R12– T2	Case pomelo	11	63	60	3	4.76	
3673	R12– T1	Siamese	8	60	58	2	3.33	
1632	R13– T5	Triumph	11	59	30	29	49.15	
4125	R11– T6	Royal	8	49	4	45	91.83	
3882	R7 – T9	McCarthy	8	46	2	44	95.65	
2690	R6 – T8	Marsh	7	44	7	37	84.09	
1713	R9 – T1	Triumph	11	42	14	28	66.66	
1632	R13– T6	Do	11	37	17	20	54.05	
1633	R12– T1	Case pomelo	11	28	23	1	3.57	4
4121	R10– T7	McCarthy	8	26	22	4	15.38	
4118	R10– T1	Walter	8	25	3	22	88.00	
1333	R16– T6	Ellen	11	22	5	17	77.27	
1995	R4 – T8	Pomelo	8	18	14	2	11.11	2
3384	R7 – T6	Saigon	8	18	13	----	----	5
4868	R11– T4	Kellogg	8	16	14	2	12.5	
2524	R11– T7	Pomelo	8	14	14	0	0	
5102	R11– T5	Lias	5	13	7	6	46.15	
4125	R11– T5	Royal	8	12	0	12	100	
3384	R7 – T5	Saigon	8	12	5	----	----	7
5144	R13– T1	Panuban	8	11	3	6	54.54	2
8442	R4 – T5	Siamese	8	11	0	0	0	
1333	R16– T5	Ellen	11	6	0	6	100	
1707	R10– T5	Marsh	11	4	0	4	100	
5152	R12– T3	Siamese	6	3	1	0	----	2
2687	R6 – T2	Duncan	8	2	0	2	100	
4868	R11– T3	Kellogg	8	2	2	0	0	
893	R17– T4	Pomelo	11	1	0	1	100	
5152	R12– T4	Siamese	6	1	0	1	100	
3391	R14– T4	Yugelar	8	1	1	0	0	
1713	R9 – T2	Triumph	11	0	0	0	0	
1707	R10– T6	Marsh	11	0	0	0	0	
1334	R15– T1	Pernambuco	11	0	0	0	0	
891	R17– T1	Pomelo	11	0	0	0	0	
891	R17– T2	Do	11	0	0	0	0	
899	R17– T7	Do	11	0	0	0	0	

TABLE 4.—*Production of bearing citrus trees at Lamao Experiment Station*—Continued.

P. I. No.	Row and tree Nos.	Scientific and common name.	Age.	Actual yield in fruits.		Fruits dropped.		Unaccountable losses.
				On tree.	Harvested.			
		Citrus maxima:	*Yrs.*			*Number.*	*Per cent.*	
3876	R5 - T7	Nakoin	8	0	0	0	0	
1334	R15- T2	Pernambuco	7	0	0	0	0	
5181	R3 -T11	Pomelo	7	0	0	0	0	
5181	R3 -T12	Do	7	------	------	------	------	
2700	R4 - T5	McCarthy	8	------	------	------	------	
1995	R4 - T4	Pomelo	8	------	------	------	------	
3389	R9 - T1	Siamese	8	------	------	------	------	
5523	R15-T12	Pomelo	6	------	------	------	------	
3392	R14- T2	Yugelar	8	------	------	------	------	
2503	R1 - T4	Boongon	8	------	------	------	------	
		Citrus mitis:						
2513	R13- T1	Kalamondin	8	2,710	2,585	125	4.61	
------	R13- T9	Do	8	1,300	1,094	206	15.84	
2355	R1 - T9	Do	8	650	530	120	18.46	
2332	R15- T1	Do	8	556	495	61	10.97	
2513	R13- T2	Do	8	275	245	30	10.90	
2332	R15- T2	Do	8	70	53	17	24.28	
------	R13-T10	Do	8	70	50	20	28.57	
		Citrus nobilis:						
1271	R7 - T4	Kishiu	11	100	35	45	45	20
3383	R7 - T2	*Citrus nobilis*	8	89	15	35	39.32	39
5173	R6 - T9	Saagkam	6	65	5	60	92.30	
745	R13- T4	Tizon, var. *papillaris*	5	28	8	20	71.42	
2693	R3 -T10	King	8	25	15	4	16.00	6
1335	R14- T2	Oneco	11	18	2	16	88.88	
1265	R2 - T2	China	11	16	2	5	81.25	9
2693	R3 - T9	King	8	3	0	3	100	
744	R20- T3	Tizon, var. *papillaris*	11	1	------	------	------	
744	R12- T9	Molana	8	------	------	------	------	
745	R20- T4	Tizon, var. *papillaris*	9	------	------	------	------	
1335	R5 - T3	Oneco	7	------	------	------	------	
1335	R15- T4	Do	7	------	------	------	------	
3883	R7 - T9	Do	6	------	------	------	------	
1335	R14- T1	Do	11	------	------	------	------	
5173	R6 -T10	Saagkam	6	------	------	------	------	
1272	R7 - T5	Konda narum	11	------	------	------	------	
1272	R7 - T6	Do	7	------	------	------	------	
		Citrus sinensis:						
2695	R5 -T10	Brown	8	517	130	329	63.63	58
1270	R7 - T1	St. Michael	11	400	210	190	47.5	
2568	R5 - T4	Misamis	8	330	110	220	66.66	
2695	R5 - T9	Brown	8	310	82	228	73.54	
1270	R7 - T2	St. Michael	11	290	120	170	58.62	
3660	R8 - T6	Balanga	8	281	82	35	12.45	164
1259	R12- T7	Malta blood	8	198	147	51	25.75	
4126	R2 - T4	Foster	8	183	30	153	83.6	

TABLE 4.—*Production of bearing citrus trees at Lamao Experiment Station*—Continued.

P. I. No.	Row and tree Nos.	Scientific and common name.	Age.	Actual yield in fruits.		Fruits dropped.		Unaccountable losses.
				On tree.	Harvested.			
		Citrus sinensis:	*Yrs.*			*Number.*	*Per cent.*	
3660	R8 - T5	Balanga	8	169	66	30	17.75	73
4119	R10- T4	Dugat	8	163	32	100	61.34	131
4126	R2 - T3	Foster	8	160	16	144	90.00	
4124	R11- T4	Carleton	8	158	78	80	50.63	
1635	R12- T5	Pineapple	11	150	116	34	22.66	
56	R8 - T9	Jaffa	11	135	23	112	82.96	
2686	R3 - T7	Pineapple	8	129	104	10	7.75	15
4123	R11- T1	Magnum bonum	8	110	90	20	18.18	
1706	R10- T3	Valencia	11	98	20	78	79.59	
5177	R12- T5	Pongkan	6	95	71	24	25.26	
1705	R10- T2	Mediterranean	11	93	59	34	36.55	
4124	R11- T3	Carleton	8	80	62	18	22.50	
2694	R4 - T1	Majorca	8	78	63	15	19.23	
1714	R9 - T3	Larrantta	11	70	16	54	77.14	
1639	R11- T4	Ruby	11	69	60	9	13.04	
1705	R10- T1	Mediterranean	9	60	17	43	71.66	
1639	R11- T3	Ruby	11	60	46	14	23.33	
2698	R13- T5	Boone	8	58	30	28	48.27	
4117	R9 - T9	Brown	8	53	39	14	26.41	
1266	R3 - T8	Whitaker	8	53	11	42	79.24	
4119	R10- T3	Dugat	8	50	25	25	50.00	
1258	R2 - T1	Jaffa	8	50	17	33	66.00	
4123	R11- T2	Magnum bonum	8	49	32	17	34.69	
1715	R9 - T5	White siletta	11	44	18	26	59.09	
1701	R11- T7	Holdfast	11	43	10	33	76.74	
1636	R12- T7	Washington navel	11	43	14	29	67.44	
1728	R8 - T5	Orange	11	34	15	19	55.88	
2697	R4 - T3	Maltese blood	8	31	2	29	93.54	
5177	R12- T6	Pongkan	6	28	13	15	53.57	
1266	R3 - T7	Whitaker	8	27	5	22	81.48	
1719	R9 -T11	Jaffa	11	27	5	22	81.48	
1706	R10- T4	Valencia	11	26	4	22	84.61	
1260	R3 - T6	Excelsior	11	25	8	7	28.00	10
2697	R4 - T4	Maltese blood	8	23	1	22	95.65	
1715	R9 - T6	White siletta	11	19	2	17	89.47	
4117	R9 -T10	Brown	8	18	2	16	88.88	
2689	R6 - T5	Enterprise	8	18	8	10	55.55	
3886	R7 - T7	Du Roi	8	17	5	12	70.58	
1258	R2 - T2	Jaffa	8	16	2	14	87.5	
1701	R11- T8	Holdfast	11	15	2	13	86.66	
966	R16- T3	Cajel	11	14	5	9	64.28	
51	R20- T1	Valencia	11	13	6	4	30.76	
1637	R12- T9	Jaffa	11	12	7	5	41.66	
966	R16- T4	Cajel	11	8	2	6	75.00	
1728	R8 - T6	Orange	11	7	2	5	71.42	
1720	R9 -T13	Bahia	11	7	2	5	71.42	
51	R20- T2	Valencia	11	6	4	2	33.33	

TABLE 4.—*Production of bearing citrus trees at Lamao Experiment Station*—Continued.

P. I. No.	Row and tree Nos.	Scientific and common name.	Age.	Actual yield in fruits.		Fruits dropped.		Unaccountable losses.
				On tree.	Harvested.			
		Citrus sinensis:	*Yrs.*			*Number.*	*Per cent.*	
2365	R5 - T9	Orange	10	5	1	4	80.00	
1719	R9 -T12	Jaffa	11	5	2	3	60.00	
1277	R2 - T3	Seville	11	4	0	4	100	
1637	R12-T10	Jaffa	11	4	0	4	100	
51	R9 - T1	Valencia	6	4	2	------	------	2
2568	R2 - T5	Orange	8	3	0	3	100	
2426	R1 -T11	*Citrus sinensis*	8	------	------	------	------	
2569	R2 - T7	Valencia	8	------	------	------	------	
1711	R10-T12	Washington navel	8	------	------	------	------	
		Citrus webberi:						
2266	R5 - T5	Kabugau, *Citrus webberi* var. *montana.*	10	460	300	100	34.7	60
5105	R11- T9	Alsem	8	56	0	20	35.71	36
5102	R11- T6	*Citrus webberi*	5	29	17	10	34.48	2
896	R17- T5	Kabugau, *Citrus webberi* var. *montana.*	11	28	20	8	28.57	
5102	R11- T5	*Citrus webberi*	5	13	7	6	46.15	
896	R17- T6	Do	11	12	8	4	33.33	
853	R18- T5	Alsem	10	4	0	4	100	
853	R18- T6	Do	19	------	------	------	------	
		Citrus excelsa:						
3388	R7 -T11	Le Nestour	8	23	5	18	78.26	
3841	R5 - T2	Tanchau	8	16	0	16	100	

Under *Citrus aurantifolia* Swingle, 3669 Everglade showed the largest yield, 712 fruits; 3670 R8–T8 Trinidad was second, with 512 fruits; and 3670 R8–T7 Trinidad third, with 267 fruits; 5163 Tahiti yielded only 9 fruits, and 5176 Lime, only 6 fruits.

Under *Citrus aurantium* Linnæus 1638 R11–T2 Sour orange showed the largest yield, 226 fruits; 1338 R11–T1 Sour orange was second, with 210 fruits; and 2385 Sour orange third, with 140 fruits; 2511 and 1264 did not bear any fruit at all.

Under *Citrus excelsa* Wester, 3388 Le Nestour gave 23 fruits and 3841 Tanchau gave 16 fruits.

Under *Citrus hystrix* de Candolle 5165 R5–T9 Suangui showed the largest yield, 120 fruits; 3668 was second, with 86 fruits; and 5165 Suangui third, with 66 fruits. No. 3655 Kolobot produced only 8 fruits; 3665 R4–T11 Kolobot, and 4830 Amontay did not produce any fruit at all.

Under *Citrus maxima,* 2665 Lukban showed the largest yield, with 138 fruits; 2687 Duncan was second, with 123 fruits; and 4118 Walter third, with 96 fruits. No. 893 Pomelo, 5152 Siamese, and 3391 Yugelar produced only one fruit each, and the following did not produce any fruit at all:

1713. Triumph.
1707. Marsh.
1334. Pernambuco.
891. Pomelo.
899. Pomelo.
3876. Nakoin.
5181. Pomelo.
2700. McCarthy.
1995. Pomelo.
3389. Siamese.
5523. Pomelo.
3392. Yugelar.
2503. Boongon.

Under *Citrus mitis* Blanco, 2513 Kalamondin showed the largest yield, 2,710 fruits; R13–T9 Kalamondin was second, with 1,300 fruits; and 2355 Kalamondin third, with 650 fruits. No. 2332 Kalamondin and R13–T10 Kalamondin gave 70 fruits each. All of the trees bearing produced fruits throughout the year.

Under *Citrus nobilis* Loureiro, 1271 Kishiu showed the largest yield, 100 fruits; 3383 was second, with 89 fruits; and 5173 Saagkam third, with 65 fruits. No. 744 R20–T3 Tizon gave only 1 fruit, while the following were non-bearers:

744. R12-T9 Molana.
745. Tizon.
1335. R5-T3 Oneco.
3883. Oneco.
5173. Saagkam.
1272. Konda narum.

Under *Citrus sinensis* Osbeck, 2695 Brown showed the largest yield, 517 fruits; 1270 St. Michael was second, with 400 fruits; and 2568 Misamis third, with 330 fruits. The following produced between 3 and 8 fruits:

966. Cajel.
1728. Orange.
1720. Bahia.
51. Valencia.
2365. Orange.
1719. Jaffa.
1277. Seville.
1637. Jaffa.
2568. Orange.

No. 2426, 2569 Valencia, and 1711 Washington navel produced no fruits.

Under *Citrus webberi* Wester, 2266 Kabugao showed the largest yield, 460 fruits; 5105 Alsem was second, with 56 fruits; and 5102 third, with 29 fruits; 853 R18–T5 Alsem produced only 4 fruits, and 853 R18–T6 yielded none.

The following trees produced fruits out of season:

Everglade lime.
Trinidad lime.
5176. Lime.
3660. Balanga orange.
2568. Misamis orange.
2686. Pineapple orange.
1635. Pineapple orange.
1639. Ruby orange.
4119. Dugat orange.
2695. Brown orange.
1260. Excelsior orange.
2689. Enterprise orange.

That the Philippine Islands is very well adapted to citriculture is indicated by the fact that there are at least a few kinds of citrus trees grown in every province excepting Cotabato.

Table 5 shows the distribution and production of citrus trees by provinces for the years ending June 30, 1921, 1922, and 1923. Mandarins, oranges, and pomelos are the only kinds of citrus considered, as these are the commonest commercially.

From Table 5 it will be seen that Batangas Province ranks first in the number of mandarin trees cultivated during 1923, with 225,900 trees cultivated, but only 123,900 bearing; Ilocos Norte is second, with 30,400 trees cultivated and 22,300 bearing; and Cebu is third, with 17,400 trees cultivated and 10,000 bearing. Although Batangas Province leads in the number of mandarin trees cultivated, yet its fruit production may be considered as poor when compared with that of other provinces. In 1923 Romblon produced 411,200 mandarins from 2,000 trees, or an average of 205 fruits per tree; Batangas had a fruit production of 11,960,000 from 123,900 trees, or an average of about 96 fruits per tree, less than half of the average fruit production per tree of Romblon. Albay comes next to Romblon in fruit production, 837,700 fruits from 4,400 trees, or about 190 fruits per tree. Pangasinan ranks third, with a production of 1,000,500 fruits from 5,400 trees, or an average of about 185 fruits per tree. Batanes had the lowest fruit production, 3,000 fruits from 100 trees, or an average of 30 mandarins per tree. It will also be noticed that Agusan, Cotabato, Lanao, and Masbate do not grow mandarins. Possibly these places are not well adapted for mandarin cultivation, or perhaps no attention has been paid to mandarin growing there.

Table 5 also shows that Batangas ranks first in the number of orange trees cultivated for the year 1923, namely, 24,470. Iloilo comes next, with 18,730 orange trees, and Pangasinan third, with 17,700 trees. Iloilo ranks first in bearing trees, 13,440; Batangas second, with 13,010; and Albay third, with 12,320. Cotabato is the only province that does not cultivate oranges. It is probable that this place is not at all adapted to citriculture, since no form of citrus is being grown there, judging from the table on citrus distribution given. Rizal in 1923 produced 239,200 oranges from 1,350 trees, or an average of 177 fruits per tree. Masbate produced from 140 trees 22,600 oranges, or an average of 161 oranges per tree. Tarlac ranks third, with 364,600 oranges from 2,290 trees, or an average of 159 oranges per tree. The Batangas production was 840,900 oranges from 13,010 trees, or an average of 64 oranges per tree, which amounted to about one-third of the average fruit production per tree of Rizal. Leyte gave the smallest average production, 38 oranges per tree.

Pomelos are produced to the greatest extent in Camarines Sur. Table 5 shows that province to have cultivated 34,350 trees; Albay is second, with 24,540 trees; and Oriental Negros third, with 22,640 trees. In the number of pomelo trees bearing for the year 1923, Camarines Sur leads the other provinces with 27,380 trees; Albay is second, with 14,350 trees; and Nueva Ecija third, with 12,670 trees. Agusan, Batanes, Bukidnon, Cotabato, Palawan, and Zamboanga Provinces do not cultivate pomelos to any great extent. In fruit production per tree Occidental Negros ranked first, with 1,100,200 pomelos from 6,720 bearing trees, or an average of 163 per tree; Oriental Negros ranked second, with 1,685,300 pomelos from 12,400 trees, or an average of 135 per tree; Albay was third, with 1,908,700 pomelos from 14,350 trees, or an average of 133 per tree. Tayabas had the lowest average production, about 28 pomelos per tree. Batangas produced 144,400 pomelos from 2,720 trees, or an average of about 53 fruits per tree, less than one-third of the average fruit production per tree of Occidental Negros.

According to the totals given in Table 5 it will be seen that the total number of citrus trees cultivated in the years 1921 to 1923 is 890,970; of bearing trees, 560,700; and of fruit production, 49,735,600.

The average cultivated area per tree is estimated to be 44 square meters. Therefore, the Philippine Islands has an estimated area under commercial citrus cultivation of about 3,920 hectares. It must not be forgotten that thousands of trees of other kinds of citrus are also grown throughout the Islands, although not to any extent commercially.

TABLE 5.—*Number of trees planted, trees bearing and the production, by provinces, for the years ending June 30, 1921, 1922, and 1923.*

MANDARIN.

Province.	Trees cultivated.			Trees bearing.			Production (fruits).			Average number of fruits produced per tree in 1923.
	1921	1922	1923	1921	1922	1923	1921	1922	1923	
Abra	200	300	300	200	100	100	21,700	8,800	11,000	110
Agusan	------	------	------	------	------	------	------	------	------	------
Albay	7,300	7,400	7,500	4,100	4,200	4,400	828,000	809,000	837,700	190.4
Antique	200	200	200	100	100	100	5,000	6,400	6,600	66
Bataan	200	300	300	100	100	100	1,400	3,100	4,300	43
Batanes	300	300	300	100	100	100	2,100	2,400	3,000	30
Batangas	220,700	223,000	225,900	124,400	125,200	123,900	12,101,000	11,819,000	11,960,000	96.4
Bohol	2,900	2,500	2,500	1,500	1,400	1,400	119,200	96,700	104,800	74.8
Bukidnon	5,000	5,200	5,300	3,200	3,400	3,400	121,800	136,000	132,600	39
Bulacan	1,900	1,500	1,500	1,400	900	900	82,000	47,000	51,800	57.5
Cagayan	6,100	6,500	6,700	4,100	4,300	4,400	413,300	414,800	449,300	102.1
Camarines Norte	300	500	500	300	200	200	31,700	12,400	12,600	63
Camarines Sur	4,500	4,600	4,800	3,400	3,500	3,600	256,600	265,200	254,300	70.6
Capiz	200	200	300	100	100	100	5,800	9,900	8,600	86
Cavite	2,900	2,900	3,000	2,400	2,500	2,500	145,000	147,000	156,000	62.4
Cebu	17,100	17,400	17,400	9,700	9,800	10,000	985,600	1,011,000	1,040,900	104
Cotabato	------	------	------	------	------	------	------	------	------	------
Davao	------	100	100	------	------	------	------	------	------	------
Ilocos Norte	29,500	30,100	30,400	21,800	21,900	22,300	1,962,200	1,968,900	2,013,100	90.2
Ilocos Sur	2,800	2,900	3,000	1,300	1,100	1,400	139,000	117,700	95,700	68.4
Iloilo	3,400	3,500	3,700	1,600	1,600	1,800	154,700	162,400	193,800	107.6
Isabela	1,800	1,800	1,700	1,400	1,600	1,500	74,600	57,900	55,400	37.0
Laguna	4,700	4,800	5,200	2,700	2,700	2,900	439,000	444,500	495,400	170.8

TABLE 5.—*Number of trees planted, trees bearing and the production, by provinces, for the years ending June 30, 1921, 1922, and 1923*—Continued.

MANDARIN—Continued.

Provinces.	Trees cultivated.			Trees bearing.			Production (fruits).			Average number of fruits produced per tree in 1923.
	1921	1922	1923	1921	1922	1923	1921	1922	1923	
Lanao										
La Union	800	800	900	400	400	500	101,700	47,300	54,500	109
Leyte	9,200	9,400	9,400	6,300	6,400	6,600	755,200	805,100	875,800	132
Marinduque	2,100	2,000	2,000	900	900	1,000	16,600	29,100	35,000	35
Masbate										
Mindoro	1,900	2,600	2,900	1,600	1,900	2,000	123,600	138,200	185,000	92
Misamis	2,100	2,100	2,100	1,600	1,600	1,600	213,800	215,600	215,600	134
Mountain	1,600	1,500	1,600	1,200	1,100	1,100	157,700	168,000	165,500	150
Nueva Ecija	400	400	500	300	300	300	37,600	39,500	55,400	184
Nueva Vizcaya	400	500	700	100	100	200	4,800	7,500	33,600	168
Occidental Negros	4,800	4,900	4,900	4,000	3,200	3,200	221,100	225,100	210,100	65
Oriental Negros	1,200	1,200	1,200	900	1,000	1,000	102,000	109,700	117,700	117
Palawan	2,000	2,100	2,300	1,100	1,100	1,300	105,000	122,600	146,000	112
Pampanga	600	600	600	300	300	300	21,000	21,000	24,000	80
Pangasinan	10,500	10,600	10,700	5,300	5,400	5,400	937,700	863,400	1,000,500	185
Rizal	1,100	1,200	1,400	100	200	200	7,100	20,000	15,500	77
Romblon	3,200	3,200	3,200	2,000	2,000	2,000	380,000	413,200	411,200	205
Samar	1,700	1,800	1,900	700	700	700	71,800	48,300	62,100	88
Sorsogon	1,300	1,200	1,300	1,000	1,000	1,000	49,100	48,300	49,100	49
Sulu	700	700	700	500	500	500	80,000	80,000	85,000	170
Surigao	200	300	300	100	100	100	4,200	10,100	6,600	66
Tarlac	300	400	400	300	200	300	29,900	32,000	21,000	70
Tayabas	10,600	10,700	10,300	6,200	6,200	6,300	1,061,700	1,011,900	1,012,700	160

Zambales	1,000	1,100	1,300	600	600	700	87,800	79,300	86,100	123
Zamboanga		100	100							
Total	369,700	375,400	381,300	219,400	220,000	221,400	22,459,100	22,075,300	22,754,900	

ORANGE.

Abra	3,780	4,000	4,230	2,360	2,510	2,570	166,700	186,100	193,800	75
Agusan	860	860	900	670	670	670	40,000	39,300	41,000	61
Albay	16,490	16,730	17,010	11,880	12,030	12,320	993,300	921,100	1,063,800	86
Antique	230	280	300	100	100	110	8,400	9,900	10,800	98
Bataan	350	370	480	80	100	100	2,700	4,000	4,500	45
Batanes	200	200	200	100	100	100	5,000	5,000	5,000	50
Batangas	23,530	24,080	24,470	12,400	12,920	13,010	758,200	723,300	840,900	64
Bohol	5,590	5,810	5,920	3,690	3,830	3,930	203,000	172,200	233,700	59
Bukidnon	200	200	200	200	200	200	9,000	10,000	9,500	47
Bulacan	590	640	650	250	270	270	10,000	12,700	13,600	50
Cagayan	12,060	12,360	12,560	9,040	9,220	9,390	671,400	698,400	723,400	77
Camarines Norte	470	490	500	270	290	310	17,500	18,500	22,800	73
Camarines Sur	5,910	5,990	6,110	3,610	3,760	3,840	217,900	203,900	255,800	66
Capiz	2,080	2,170	2,210	1,430	1,470	1,470	149,300	159,500	160,400	109
Cavite	2,040	2,040	2,270	1,820	1,880	1,950	203,400	237,600	206,900	106
Cebu	12,850	13,260	13,750	9,620	9,750	10,070	751,500	808,000	839,800	83
Cotabato										
Davao	730	750	800	300	300	300	29,600	29,100	38,800	129
Ilocos Norte	13,420	13,910	14,370	9,370	9,760	9,840	1,016,000	1,090,800	954,800	97
Ilocos Sur	5,480	5,750	5,950	3,530	3,690	3,920	442,100	470,000	553,300	141
Iloilo	17,700	18,410	18,730	12,200	13,270	13,440	913,700	1,040,300	1,098,200	81
Isabela	7,190	7,270	7,480	6,820	6,840	6,850	375,200	382,600	388,700	56
Laguna	2,420	2,560	2,610	1,790	1,790	1,830	107,200	125,500	134,500	73
Lanao	1,780	1,830	1,850	1,410	1,440	1,460	79,200	91,700	93,800	64
La Union	4,220	4,210	4,300	2,070	2,120	2,140	189,900	213,100	221,700	103
Leyte	7,780	7,980	8,010	6,500	6,710	6,770	197,100	229,300	263,700	38
Marinduque	4,740	4,770	5,000	2,270	2,270	2,270	113,900	122,900	124,100	54

TABLE 5.—*Number of trees planted, trees bearing and the production, by provinces, for the years ending June 30, 1921, 1922, and 1923*—Continued.

ORANGE—Continued.

Province.	Trees cultivated.			Trees bearing.			Production (fruits).			Average number of fruits produced per tree in 1923.
	1921	1922	1923	1921	1922	1923	1921	1922	1923	
Masbate	300	300	300	130	140	140	13,900	14,800	22,600	161
Mindoro	1,320	1,360	1,420	750	780	780	46,300	55,200	59,200	75
Misamis	8,390	8,410	8,770	5,030	5,020	5,020	203,400	220,700	256,200	51
Mountain	3,400	3,500	3,670	2,500	2,540	2,540	138,900	144,300	157,600	62
Nueva Ecija	4,190	4,670	4,740	3,100	3,120	3,120	255,200	257,300	293,400	94
Nueva Vizcaya	810	900	1,000	460	470	470	47,500	55,000	53,700	114
Occidental Negros	11,380	11,400	11,540	10,060	10,070	10,070	677,500	761,200	778,600	77
Oriental Negros	3,210	3,240	2,680	1,480	1,550	1,550	144,900	156,900	181,400	117
Palawan	2,040	2,120	2,190	1,450	1,490	1,490	121,200	121,200	132,100	88
Pampanga	800	800	800	800	800	800	93,000	94,000	96,000	120
Pangasinan	17,000	17,390	17,770	9,050	9,250	9,250	787,200	835,700	893,200	96
Rizal	2,260	2,320	2,370	1,340	1,350	1,350	189,400	232,500	239,200	177
Romblon	870	920	930	640	650	650	46,800	49,400	52,300	80
Samar	4,240	4,480	4,590	3,110	3,100	3,100	131,600	136,500	158,900	51
Sorsogon	1,640	1,650	1,660	1,040	1,040	1,040	114,400	119,400	106,900	102
Sulu	200	200	200	200	200	200	10,000	8,000	10,000	50
Surigao	3,680	3,710	3,730	800	820	820	55,100	56,800	62,900	76
Tarlac	3,530	3,660	3,750	2,260	2,290	2,290	342,400	362,600	364,600	159
Tayabas	7,660	7,750	7,850	3,990	4,020	4,020	320,300	332,100	349,600	86
Zambales	1,280	1,360	1,500	630	640	640	57,800	59,800	65,400	102
Zamboanga	300	300	300	--------	--------	--------	--------	--------	--------	--------
Total	231,190	237,360	242,620	152,600	156,630	158,470	11,468,000	12,078,200	12,831,100	--------

POMELO.

Abra	270	280	290	40	60	60	2,000	2,700	2,700	45
Agusan	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Albay	23,970	24,220	24,540	13,620	14,150	14,350	1,639,900	1,772,700	1,908,700	133
Antique	1,550	1,560	1,600	970	960	1,000	38,900	38,400	50,000	50
Bataan	2,890	3,020	3,100	1,040	1,070	1,160	78,900	80,700	94,900	81
Batanes	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Batangas	3,450	3,570	3,790	2,580	2,610	2,720	114,100	118,700	144,400	53
Bohol	1,630	1,650	1,690	590	590	590	12,000	12,200	17,900	30
Bukidnon	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Bulacan	4,510	4,630	4,840	2,900	2,970	3,080	78,800	92,300	115,600	37
Cagayan	5,700	5,730	5,840	3,900	3,940	4,040	97,100	100,800	134,500	33
Camarines Norte	560	590	600	440	450	450	26,900	26,500	28,000	62
Camarines Sur	33,860	34,090	34,350	27,060	27,300	27,380	2,515,100	2,661,500	3,002,600	109
Capiz	1,940	2,000	2,070	1,510	1,550	1,610	66,400	59,100	75,100	46
Cavite	1,270	1,280	1,340	1,060	1,070	1,110	25,100	26,900	37,500	33
Cebu	10,640	11,100	11,370	7,310	7,440	7,540	418,200	434,300	465,200	61
Cotabato	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Davao	490	490	500	390	400	400	7,800	9,000	12,000	30
Ilocos Norte	3,320	3,380	3,440	1,990	2,020	2,050	39,800	52,000	60,300	29
Ilocos Sur	8,380	8,490	8,610	5,350	5,390	5,480	218,000	218,700	260,700	47
Iloilo	15,470	15,580	15,730	11,700	11,880	12,390	534,100	591,600	796,800	64
Isabela	270	270	310	--------	--------	--------	--------	--------	--------	--------
Laguna	3,230	3,250	3,330	1,950	2,000	2,050	55,200	72,300	92,200	45
Lanao	350	350	350	--------	--------	--------	--------	--------	--------	--------
La Union	4,100	4,190	4,250	2,270	2,330	2,370	88,400	93,700	116,500	49
Leyte	3,230	3,380	3,380	2,630	2,630	2,730	86,600	96,000	116,000	42
Marinduque	3,540	3,700	3,740	2,980	3,030	3,070	89,400	100,900	132,900	43
Masbate	1,100	1,100	1,110	400	400	400	12,000	16,000	20,000	50
Mindoro	3,520	3,530	3,590	2,850	2,850	2,850	135,100	155,000	183,200	64
Misamis	1,000	1,020	1,050	150	150	150	3,000	5,000	4,500	30
Mountain	510	540	560	330	350	350	22,700	27,100	27,500	78

TABLE 5.—*Number of trees planted, trees bearing and the production, by provinces, for the years ending June 30, 1921, 1922, and 1923*—Continued.

POMELO—Continued.

Province.	Trees cultivated.			Trees bearing.			Production (fruits).			Average number of fruits produced per tree in 1923.
	1921	1922	1923	1921	1922	1923	1921	1922	1923	
Nueva Ecija	14,180	14,200	14,290	12,610	12,650	12,670	651,700	751,300	870,300	68
Nueva Vizcaya	620	630	650	330	340	350	14,500	12,100	13,300	38
Occidental Negros	7,610	7,660	7,950	6,460	6,540	6,720	600,900	943,100	1,100,200	163
Oriental Negros	22,160	22,390	22,640	12,270	12,350	12,400	1,554,400	1,551,200	1,685,300	135
Palawan										
Pampanga	5,500	5,540	5,550	4,490	4,490	4,640	191,500	163,400	231,600	49
Pangasinan	17,340	17,530	18,030	10,010	10,280	10,440	412,700	442,100	470,200	45
Rizal	4,830	4,820	4,940	2,710	2,720	2,790	140,000	137,500	171,200	61
Romblon	3,370	3,840	3,910	3,030	3,110	3,100	213,300	232,800	255,000	82
Samar	8,400	8,530	8,770	7,250	7,400	7,580	243,000	248,700	290,500	38
Sorsogon	12,240	12,220	12,350	9,920	9,780	9,860	652,300	777,700	766,100	77
Sulu	1,100	1,100	1,100	870	870	870	29,400	30,100	30,100	34
Surigao	500	500	500	400	300	300	20,000	15,000	15,000	50
Tarlac	2,490	2,540	2,570	1,140	1,180	1,200	35,600	37,000	67,800	56
Tayabas	16,390	16,490	16,510	7,420	7,520	7,570	235,700	240,600	216,300	28
Zambales	1,880	1,920	1,920	840	880	960	49,400	56,100	67,000	69
Zamboanga										
Total	259,360	262,900	267,050	175,760	178,000	180,830	11,449,900	12,502,800	14,149,600	

Of the citrus-producing provinces in the Philippine Islands, Batangas alone supplies the Manila markets with mandarins and oranges. The production of the other provinces is consumed locally. To give those interested an idea as to the tonnage of oranges[3] annually shipped to Manila from Batangas, the data obtained from the Manila Railroad Company are here presented as Table 6.

TABLE 6.—*Citrus fruits shipped annually from Batangas Province to Manila, 1910 to 1923.*

Year.	Tons.	Fruits (calculated).	Estimated value.	Year.	Tons.	Fruits (calculated).	Estimated value.
			Pesos.				*Pesos.*
1910	8,000	58,000,000	1,160,000.00	1917	2,853	20,493,099	409,861.98
1911	427	3,000,000	60,000.00	1918	1,968	14,136,144	282,722.88
1912	2,657	19,085,231	381,704.62	1919	3,549	25,492,467	509,849.34
1913	4,816	34,593,328	691,866.56	1920	2,638	18,948,754	378,975.08
1914	2,510	18,029,330	360,586.60	1921	776	5,574,008	111,480.16
1915	2,040	14,653,320	293,066.40	1922	1,705	12,247,015	244,940.30
1916	1,979	14,215,157	284,303.14	1923	2,110	15,156,130	303,122.60

These figures represent shipments by freight only; they do not include shipments by truck and express.

The 41 kinds of citrus that we have studied and the 5 studied by Gibbs and Agcaoili[4] constitute only a small part of the whole for, as has already been mentioned, there are about 800 types of citrus growing in the Philippines, including the valid Philippine species, the hybrids, and the introduced species.

CHEMICAL ANALYSIS

Table 7 gives the common names of the 41 kinds of citrus fruits that were analyzed, their botanical names, the soil in which grown, description of the fruits, and whether common or rare forms. It will be noticed that most of the fruits are of the introduced species under experimentation at Lamao Experiment Station.

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[3] Including mandarins, oranges, and a few pomelos.

[4] Philip. Journ. Sci. § A 7 (1912) 403.

TABLE 7.—*List of citrus fruits analyzed; all from Lamao Experiment Station.*

P. I. No.	Variety name.	Scientific name.	Soil.	Description of fruit.	Common or rare.	Native or foreign.
3660	Balanga orange	*Citrus sinensis* Osbeck	Loam	Fruits round; rind rather smooth, medium fairly loose; flesh light yellow; quality good; fairly juicy and sweet.	Rare	Native.
2698	Boone orange	do	Sandy clay loam	Fruits round; flesh light yellow; rind fairly smooth; juicy and subacid.	do	Foreign.
2695	Brown orange	do	do	Fruits oval; flesh light yellow; rind smooth and fairly loose; quality fairly good; fairly juicy and subacid.	do	Do.
4124	Carleton orange	do	do	Fruits oblong; flesh light yellow; rind fairly loose and smooth; quality fair; fairly juicy and sweet.	do	Do.
4119	Dugat orange	do	do	Fruits round; flesh yellow; rind smooth and fairly loose; quality fairly good; fairly juicy and sweet.	do	Do.
2340	Igorot orange	*Citrus* sp	Loam	Fruits oval; flesh yellowish green; rind rough and fairly loose; quality fairly good; fairly juicy and subacid.	do	Native.
1637	Jaffa orange	*Citrus sinensis* Osbeck	Sandy clay loam	Fruits round; flesh light yellow; rind smooth and fairly loose; quality good; fairly juicy and sweet.	do	Foreign.
1714	Larrantta orange	do	Loam	Fruits round; flesh light yellow; rind smooth and fairly loose; fairly juicy and subacid.	do	Do.
-------	Majorca orange	do	Sandy clay loam	Fruits round; flesh light yellow; rind rather rough; quality fairly good; juicy and sweet.	do	Do.
1259	Malta blood orange	do	do	Fruits oblong; flesh light yellow; rind rather rough and fairly loose; quality good; fairly juicy and sweet.	do	Do.

4123	Magnum bonum orange	do	do	Fruits round; flesh light yellow; rind smooth and fairly loose; quality good; fairly juicy and sweet.	do	Do.
2568	Misamis orange	do	do	Fruits oval; flesh light yellow; rind smooth and fairly loose; quality and flavor good; fairly juicy and sweet.	do	Native.
1635	Pineapple orange	do	do	Fruits round; flesh yellow; rind smooth and fairly loose; quality and flavor good; fairly juicy and sweet.	do	Foreign.
2686	Do	do	do	Fruits round; flesh light yellow; rind smooth and fairly loose; quality good; fairly juicy and sweet.	do	Do.
5177	Pongkan orange	do	do	Fruits round; rind rather smooth and thin; flesh light yellow; juicy and subacid.	do	Do.
1618	Sampson orange	*Citrus* hybrid	do	Fruits somewhat round; flesh light yellow; rind smooth and loose; quality poor; rather juicy and sweet.	do	Do.
1638	Sour orange	*Citrus aurantium* Linnæus	do	Fruits oblong; rind rather rough and thick; flesh very light yellow; rather juicy and acid.	do	Do.
1706	Valencia orange	*Citrus sinensis* Osbeck	do	Fruits round; flesh light yellow; rind smooth and fairly loose; quality fairly good; fairly juicy and subacid.	do	Do.
1715	White siletta orange	do	do	Fruits round; flesh light yellow; rind smooth, medium and fairly loose; quality fairly good; not very juicy but sweet.	do	Do.
1266	Whitaker orange	do	do	Fruits round; flesh light yellow; rind smooth and rather loose; quality very good; very juicy and sweet.	do	Do.
2687	Duncan grapefruit	*Citrus maxima* Merrill	do	Fruits oval; flesh white; rind smooth and fairly loose; quality fairly good; juicy and subacid.	do	Do.
1313	Ellen grapefruit	do	do	Fruits oval; flesh white; rind rough; quality fairly good; juicy and subacid.	do	Do.

TABLE 7.—*List of citrus fruits analyzed; all from Lamao Experiment Station*—Continued.

P. I. No.	Variety name.	Scientific name.	Soil.	Description of fruit.	Common or rare.	Native or foreign.
1631	Marsh grapefruit	*Citrus maxima* Merrill	Sandy clay loam	Fruits somewhat round; flesh light yellow; rind rather smooth and thick; not juicy but sweet.	Rare	Foreign.
4121	McCarthy grapefruit	do.	do.	Fruits oblong; flesh light yellow; rind rather rough and fairly loose; quality fairly good; fairly juicy and sweet.	do.	Do.
1334	Pernambuco grapefruit	do.	Loam	Fruits slightly oval; rind smooth, medium and fairly loose; quality fair; fairly juicy and subacid.	do.	Do.
1632	Triumph grapefruit	do.	Sandy clay loam	Fruits almost round; flesh light yellow; rind smooth; flavor and quality good; not very juicy but sweet.	do.	Do.
4118	Walter grapefruit	do.	do.	Fruits oval; flesh white; rind smooth and fairly loose; quality fairly good; juicy and subacid.	do.	Do.
1333	Ellen pomelo	do.	do.	Fruits oval; flesh white; rind rough and fairly loose; quality good; juicy and subacid.	do.	Do.
1635	Pink pomelo	do.	do.	Fruits oval; flesh light pink; rind rough and fairly loose; quality good; somewhat dry but sweet.	do.	Do.
3669	Everglade lime	*Citrus aurantifolia* Swingle	do.	Fruits small and oval; flesh greenish white; rind smooth and thin; rather juicy and very acid.	do.	Do.
5163	Tahiti lime	do.	Loam	Fruits oblong and slightly elongated at two ends; flesh pale green; rind rough, thick, and firm; quality good; fairly juicy and very acid.	do.	Do.
3670	Trinidad lime	do.	Sandy clay loam	Fruits flattened; flesh yellowish green; rind smooth, tight; quality good; fairly juicy and very acid.	do.	Do.

5175	Lemon	*Citrus limonia* Osbeck	do	Fruits small and oval; rind rather smooth; not juicy and very acid.	do	Do.
2502	Biasong	*Citrus micrantha* Wester	do	Fruits oval; flesh light green; rind rough and tight; fairly juicy and very acid; quality poor.	do	Native.
5497	Gauid	*Citrus webberi* var. *montana* Wester	do	Fruits flattened; flesh light green; rind rough and fairly loose; quality fairly good; fairly juicy and very acid.	Common	Do.
5658	Camisan	*Citrus* sp	Loam	Fruits round; flesh light yellow; rind smooth and fairly loose; quality fairly good; fairly juicy and subacid.	Rare	Do.
4827	Lombog	*Citrus pseudolimonum* Wester	Sandy clay loam	Fruits small and oval; flesh light green; rind rather rough; fairly juicy and very acid.	do	Do.
1273	Satsumamikan mandarin	*Citrus nobilis* Loureiro	do	Fruits oval; flesh white; rind rough and loose; quality poor; juicy and acid.	do	Foreign.
5165	Suangui	*Citrus hystrix* var. *torosa* Wester	do	Fruits rather small; flesh light green; rind very rough and corrugated; not juicy and very acid.	do	Native.
3383		*Citrus madurensis* Loureiro	do	Fruits flattened; rind smooth, thin, and loose; quality poor; fairly juicy and subacid.	do	Foreign.
3671		*Citrus* sp	do	Fruits oval; flesh light yellow; rind rough and fairly loose; quality poor; fairly juicy and acid.	do	Do.

As soon as the fruits arrived at the laboratory, they were weighed and their average weights noted. It will be seen from Table 8 that of all the forms of citrus analyzed, the pomelos were the heaviest. The pink pomelo averaged 695 grams, or a little over 1.5 pounds; most of the grapefruits weighed between 400 and 500 grams, or about 1 pound per fruit. The oranges came third, the heaviest ones, Sour orange, 384.9 grams; Igorot, 375; Balanga, 265; Valencia, 207.5; Misamis, 206.6; and the rest weighed between 104 and 200. The limes were the smallest; the average weight ranged from 34 to 120.1 grams.

After having been weighed, the fruits were peeled and the average weights of the peelings noted. Then the peeled fruits were opened and the seeds removed. The average number of seeds per fruit, the average weight of seeds per fruit, and the average weight of one seed are also given in Table 8. The average weights of peelings, pulps, seeds, and juice, expressed in percentages, are given also in the table. The juice was expressed from the fruit by means of a hand press, strained through a piece of fine cloth to get rid of any pulp or seeds, measured to determine the average number of mils per average fruit, and the specific gravity determined by means of a hydrometer. Table 8 also gives the specific gravity of the juices of the different citrus fruits and the quantity of juice, in percentage, per average fruit.

It will be noted that among the oranges the Boone orange has the highest percentage of juice, 56.05; Valencia, 52.67; and Magnum bonum, 51.38. Among the other citrus fruits that are not oranges Camisan has the highest percentage of juice, 53.55. The rest range from 31 per cent up. The specific gravity was found to lie between 1.028 and 1.042.

Among the oranges, Sour orange has the highest percentage of peeling, 39.57; Jaffa has the highest percentage of pulp, 41.61; and Brown orange has the lowest percentage of peeling, 15.63. Igorot has the lowest percentage of pulp, 17.2, and Malta blood the least average number of seeds per fruit, namely, 2.5. Among the other citrus fruits that are not oranges Marsh grapefruit has the highest percentage of peeling, 38.57; Lemon the highest percentage of pulp, 39.58; Pink pomelo the highest number of seeds, 58. Trinidad lime has the lowest percentage of peeling, 19.94; Walter grapefruit the lowest percentage of pulp, 18.21; and Tahiti lime the least number of seeds, 1.

TABLE 8.—*Analyses of citrus fruits.*

P. I. No.	Name.	Average weight of fruit.	Peeling.		Pulp.		Juice.			Seeds.			
			Average weight.	Weight.	Average weight.	Weight.	Average volume.	Specific gravity.	Weight.	Average number per fruit.	Average weight per fruit.	Average weight of a seed.	Weight.
		g.	*g.*	*P. ct.*	*g.*	*P. ct.*	*cc.*		*P. ct.*	*g.*	*g.*	*g.*	*P. ct.*
3660	Balanga orange	265.0	66.66	25.15	67.87	25.61	120.5	1.033	46.97	21.7	6.0	0.276	2.26
2698	Boone orange	167.2	36.40	21.77	35.40	21.17	91.0	1.030	56.05	11.2	1.7	0.151	1.01
2695	Brown orange	160.56	25.10	15.63	52.58	32.74	78.5	1.036	50.68	8.1	1.56	0.192	0.97
4124	Carleton orange	181.90	50.08	27.53	50.22	27.60	78.0	1.028	44.08	8.1	1.50	0.185	0.82
9119	Dugat orange	162.60	44.62	27.44	56.95	35.02	57.5	1.029	36.38	10.37	1.875	0.180	1.15
2340	Igorot orange	375.00	148.00	39.46	64.85	17.20	150.0	1.029	41.16	30.5	8.00	0.262	2.13
1637	Jaffa orange	159.25	35.00	21.97	66.27	41.61	55.0	1.036	35.77	6.5	1.00	0.154	0.63
1714	Larrantta orange	146.60	41.20	28.10	43.74	29.80	51.5	1.034	40.55	16.25	2.21	0.142	1.50
	Majorca orange	125.50	32.93	26.23	31.48	25.08	58.57	1.031	48.11	3.14	0.714	0.227	0.569
1259	Malta blood orange	104.00	26.00	25.00	41.77	40.15	35.00	1.031	34.69	2.50	0.25	0.100	0.240
4123	Magnum bonum orange	164.70	32.91	19.98	45.84	27.83	82.00	1.032	51.38	6.60	1.33	0.200	0.810
2568	Misamis orange	206.60	46.90	22.70	56.12	27.19	95.00	1.034	47.54	19.30	5.35	0.277	2.59
1635	Pineapple orange	132.12	24.00	18.16	37.51	28.38	62.5	1.035	48.96	21.25	5.93	0.250	4.49
2686	Pineapple orange	165.00	43.30	26.24	48.11	29.15	66.66	1.035	41.81	16.00	4.60	0.291	2.78
5177	Pongkan orange	172.30	37.11	21.53	49.23	28.58	80.00	1.030	47.82	16.00	3.55	0.222	2.05
1618	Sampson orange	150.00	33.55	23.70	47.06	31.37	63.90	1.039	44.19	8.90	1.10	0.133	0.733
1638	Sour orange	384.90	152.30	39.57	70.60	18.34	150.00	1.032	40.21	44.00	7.20	0.163	1.870
1706	Valencia orange	207.50	45.00	21.68	51.72	24.92	106.00	1.031	52.67	7.50	1.50	0.200	0.720
1715	White siletta orange	122.00	31.00	25.40	42.70	35.04	45.00	1.040	38.36	9.50	1.50	0.157	1.140
1266	Whitaker orange	167.70	40.50	24.15	44.42	26.48	80.00	1.033	49.27	13.60	0.14	0.0103	0.083
2687	Duncan grapefruit	460.58	141.15	30.64	153.21	33.26	145.8	1.035	32.76	51.00	15.33	0.300	3.33
1313	Ellen grapefruit	280.00	98.50	35.17	75.82	27.07	98.00	1.036	36.26	23.30	4.16	0.178	1.48
1631	Marsh grapefruit	328.33	126.66	38.57	96.74	29.46	100.00	1.036	31.55	3.80	1.33	0.347	0.405
4121	McCarthy grapefruit	521.37	167.87	32.19	119.48	22.91	210.5	1.031	41.62	55.00	17.00	0.309	3.260
1334	Pernambuco grapefruit	400.00	100.00	25.00	106.73	26.68	175.0	1.033	45.19	46.00	12.50	0.271	3.125

TABLE 8.—*Analyses of citrus fruits*—Continued.

P. I. No.	Name.	Average weight of fruit.	Peeling.		Pulp.		Juice.			Seeds.			
			Average weight.	Weight.	Average weight.	Weight.	Average volume.	Specific gravity.	Weight.	Average number per fruit.	Average weight per fruit.	Average weight of a seed.	Weight.
		g.	*g.*	*P. ct.*	*g.*	*P. ct.*	*cc.*		*P. ct.*	*g.*	*g.*	*g.*	*P. ct.*
1632	Triumph grapefruit	305.00	87.00	28.52	111.11	36.43	96.0	1.038	32.67	20.00	7.25	0.362	2.37
4118	Walter grapefruit	369.60	113.20	30.60	67.33	18.21	169.16	1.037	47.46	51.83	13.66	0.263	3.69
1333	Ellen pomelo	322.50	83.00	25.73	95.73	29.68	133.00	1.032	42.56	38.50	6.50	0.168	2.01
1635	Pink pomelo	695.00	262.00	37.69	161.50	23.23	250.0	1.042	37.48	58.00	11.00	0.088	1.57
3669	Everglade lime	40.16	11.73	29.20	8.58	21.36	18.75	1.032	48.18	4.83	0.50	0.103	1.24
	Tahiti lime	120.10	36.06	30.02	26.66	22.20	55.5	1.032	47.69	1.00	0.10	0.100	0.08
3670	Trinidad lime	34.35	6.85	19.94	11.50	33.48	15.00	1.037	45.28	3.60	0.45	0.125	1.31
5175	Lemon	57.83	19.72	34.09	22.89	39.58	14.44	1.027	25.60	4.66	0.40	0.083	0.69
2502	Biasong	52.00	14.45	27.78	11.26	21.66	22.00	1.038	43.91	27.10	3.45	0.127	6.60
5497	Gauid	135.10	38.43	28.44	39.39	29.16	48.2	1.030	36.74	29.37	7.625	0.259	5.64
5658	Camisan	141.30	32.62	23.08	28.55	20.21	72.5	1.041	53.55	28.70	4.50	0.156	3.18
4827	Lombog	72.05	21.14	29.34	18.17	25.21	28.0	1.031	40.06	52.90	4.00	0.074	5.56
1273	Satsumamikan mandarin	386.00	116.00	30.05	99.51	25.77	160.00	1.036	42.94	17.50	4.25	0.242	1.10
5165	Suangui	64.00	22.08	35.65	17.40	27.18	20.00	1.038	32.43	29.90	3.04	0.101	4.75
3383	*Citrus madurensis*	100.83	29.16	28.92	34.17	33.88	33.33	1.038	34.31	13.50	2.91	0.210	2.88
3671	*Citrus* sp.	313.00	82.16	26.24	59.35	18.96	160.00	1.039	53.11	13.30	5.25	0.390	1.67

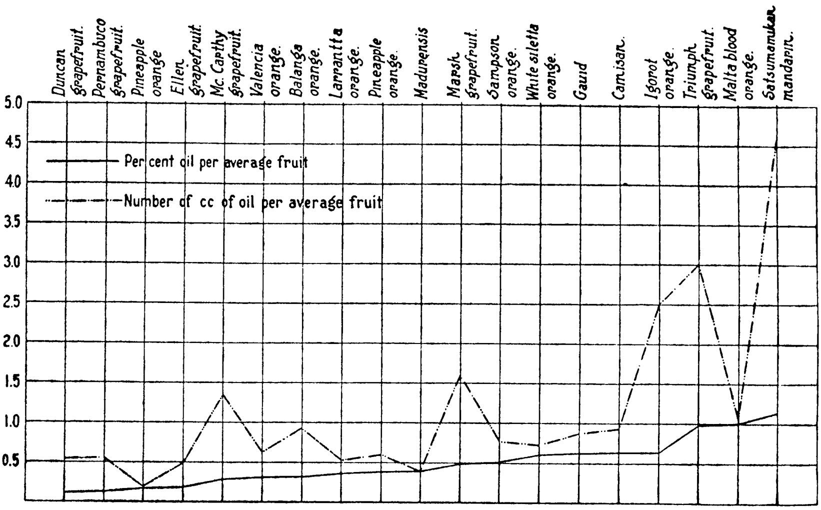

FIG. 1. Percentage and quantity of oil in various citrus fruits.

The juice was analyzed quantitatively for total solids, sucrose, reducing sugars, citric acid, and available citric acid.

METHODS OF ANALYSIS

Total solids.—Total solids were determined in the usual manner, using the steam bath and an electric oven.

Sucrose.—Exactly 26 grams of the original juice were transferred to a 100-cubic centimeter volumetric flask, clarified with alumina cream and lead subacetate solutions; made up to the 100-cubic centimeter mark; filtered and polarized in a 200-millimeter tube; and 50 cubic centimeters of the solution used for direct polarization were inverted and the true sucrose was determined by the Clerget-Herzfeld formula:

$$S = \frac{(a-b)\,100}{142.66 - t/2.}$$

Reducing sugars.—Determinations of reducing sugars were made by using the volumetric Fehling's method.

Citric acid.—To obtain the percentage of citric acid in an average original juice, a weighed quantity of the average juice was transferred to a beaker, diluted with a small quantity of distilled water and titrated against 0.1 *N* alkali solution, using phenolphthalein as indicator. The number of cubic centimeters of 0.1 *N* alkali used, multiplied by 0.64 and divided by the weight of the sample taken, gives the percentage of citric acid in the original juice.

TABLE 9.—*Analyses of juices in citrus fruits.*

P. I. No.	Name.	Total solids.	Sucrose.	Reducing sugars.	Citric acid in original juice.	Citric acid in juice expressed from an average fruit.	Citric acid in pulp extract.	Total citric acid in fruit.	
		P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*g.*	*P. ct.*
3660	Balanga orange	7.890	3.908	2.560	0.870	0.408	0.0332	1.136	0.421
2698	Boone orange	8.530	2.898	1.220	0.642	0.358	0.0608	0.701	0.419
2695	Brown orange	9.610	3.260	3.125	0.963	0.470	0.0685	0.865	0.539
4124	Carleton orange	7.859	3.300	2.170	0.517	0.208	0.0208	0.356	0.270
4119	Dugat orange	8.113	3.500	2.500	0.533	0.188	0.0296	0.354	0.218
2340	Igorot orange	8.104	1.950	3.844	1.294	0.515	0.0970	2.295	0.612
1637	Jaffa orange	9.702	3.970	2.971	0.682	0.235	0.0621	0.474	0.298
1714	Larrantta orange	9.167	3.520	2.856	1.254	0.491	0.0112	0.886	0.604
	Majorca orange	7.140	3.211	3.125	0.677	0.317	0.0667	0.480	0.383
1259	Malta blood orange	8.227	2.958	2.358	1.166	0.392	0.0529	0.463	0.445
4123	Magnum bonum orange	9.008	4.170	3.120	0.528	0.278	0.0700	0.575	0.349
2568	Misamis orange	9.220	4.16	2.970	0.748	0.347	0.0263	0.765	0.370
1635	Pineapple orange	10.343	4.515	2.630	0.781	0.369	0.0572	0.563	0.426
2686	Do	8.720	4.850	2.560	0.550	0.222	0.0365	0.426	0.258
5177	Pongkan orange	7.476	2.820	1.790	0.762	0.364	0.0522	0.715	0.415
1618	Sampson orange	8.490	2.271	4.440	1.620	0.690	0.0935	1.175	0.783
1638	Sour orange	8.510	1.723	3.220	2.960	1.190	0.1530	5.171	1.343
1706	Valencia orange	8.414	2.724	2.77	0.858	0.438	0.0318	0.975	0.470
1715	White siletta orange	9.860	4.850	3.10	0.680	0.250	0.0487	0.365	0.300
1266	Whitaker orange	8.930	3.130	3.33	0.691	0.340	0.0238	0.611	0.364
2687	Duncan grapefruit	9.620	2.910	2.94	1.551	0.490	0.0947	2.697	0.585
1313	Ellen grapefruit	8.620	2.400	2.53	1.76	0.616	0.0913	1.980	0.707
1631	Marsh grapefruit	9.150	2.580	3.51	1.50	0.459	0.133	1.937	0.590
4121	McCarthy grapefruit	8.216	2.810	3.12	1.232	0.443	0.271	3.723	0.714
1334	Pernambuco grapefruit	8.250	2.110	2.22	1.500	0.656	0.0925	2.998	0.749

1632	Triumph grapefruit	10.130	5.190	2.38	0.858	0.163	0.0217	0.933	0.185
4118	Walter grapefruit	9.130	2.660	3.571	1.463	0.511	0.142	2.418	0.654
1333	Ellen pomelo	8.540	2.27	2.380	1.298	0.535	0.264	2.579	0.799
1635	Pink pomelo	10.960	4.77	2.745	0.383	0.138	0.110	1.069	0.154
3669	Everglade lime	9.734	0.00	0.210	6.640	3.198	0.749	1.585	3.940
	Tahiti lime	8.474	0.00	1.692	6.840	3.160	0.563	4.472	3.640
3670	Trinidad lime	9.81	0.00	0.062	7.159	3.120	0.605	1.281	3.730
5175	Lemon	7.392	0.00	0.973	3.711	0.951	0.460	0.816	1.410
2502	Biasong	8.927	0.00	0.060	7.570	3.202	0.455	1.902	3.655
5497	Gauid	8.216	0.00	0.550	4.610	1.640	0.296	2.621	1.940
5658	Camisan	10.808	0.155	4.500	2.380	1.220	0.141	1.925	1.360
4827	Lombog	9.076	0.00	0.00	6.050	2.423	0.529	2.127	2.952
1273	Satsumamikan mandarin	9.160	0.00	3.700	3.064	1.270	0.186	5.623	1.450
5165	Suangui	10.417	0.00	0.064	6.209	2.014	0.557	1.645	2.570
3383	*Citrus madurensis*	9.020	4.85	2.740	0.510	0.168	0.0363	0.206	0.205
3671	*Citrus* sp.	10.117	1.400	4.160	2.690	1.521	0.2123	5.426	1.734

To obtain the percentage of possible available citric acid per average fruit, the percentage of citric acid in the average juice was multiplied by the average weight of juice per fruit and the total divided by the average weight of the fruit; the result, multiplied by 100, gave the average percentage of citric acid recovered from the juice expressed from an average fruit.

The total citric acid is the amount of citric acid in the whole fruit. It is calculated from the sum of the citric acid in the juice and the citric acid in the pulp.

Table 9 shows the analyses of the juices. According to this table and Plate 1, Triumph grapefruit has the highest percentage of sucrose in the original juice, namely, 5.19; and Everglade lime, Tahiti lime, Trinidad lime, Lemon, Biasong, Gauid, Lombog, Satsumamikan mandarin, and Suangui do not contain any sucrose at all.

Camisan, Sampson orange, and *Citrus* species have the highest percentages of reducing sugars; namely, 4.5, 4.44, and 4.16, respectively; Biasong, Trinidad lime, and Suangui have the lowest, 0.00, 0.062, and 0.064, respectively.

It is very interesting to note that the fruits that are high in sugars are very low in citric acid. Table 8 shows that Biasong, Trinidad lime, Tahiti lime, and Everglade lime have the highest percentages of citric acid in the juice, 7.57, 7.159, 6.84, and 6.64, respectively; they have no sucrose and very low percentages of reducing sugars.

The total citric acid per average fruit is highest in Satsumamikan mandarin, 5.623 grams, and lowest in *Citrus madurensis,* 0.206 gram. The percentages of average total citric acid per average fruit are highest in Everglade lime, 3.94; Trinidad lime, 3.73; Biasong, 3.655; and Tahiti lime, 3.64; and are lowest in Pink pomelo, 0.154; Triumph grapefruit, 0.185; *Citrus madurensis,* 0.205; and Dugat orange, 0.218.

Crystallized citric acid was prepared by the usual chalk lime method; excellent crystals were easily obtained from the mixed juice of the fruits. The percentage yield on juice was not taken.

The process used in extracting the oil from the peeling was carefully regulated steam distillation. The peeling was passed through a grinder, transferred to a distilling apparatus with a small quantity of water, and distilled. The oil that floated on top of the distillate was separated and measured. From this the average number of mils per average fruit was determined. The oil obtained by distillation differs from that obtained by expression in that the distilled oil is practically colorless and does not have the bitter taste of the yellow expressed oil. The nonvolatile matter present in the oil obtained by pressing is absent in distilled oil.

Table 10 and fig. 2 show that Satsumamikan mandarin is highest in both volume and percentage of oil per average fruit.

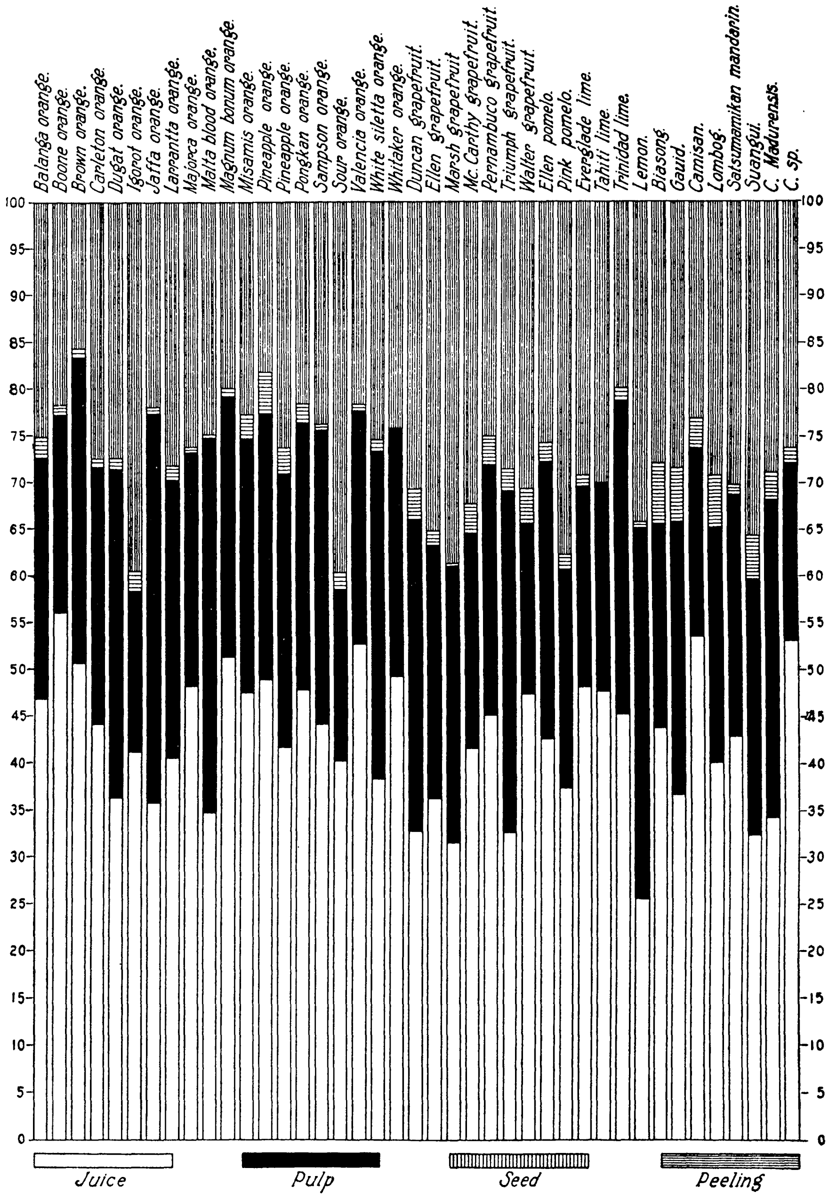

FIG. 2. Juice, pulp, seed, and peeling in various citrus fruits.

Duncan grapefruit has the lowest percentage of oil per average fruit, and pineapple orange the least volume of oil per average fruit.

TABLE 10.—*Showing volume and percentage of oil in citrus fruits.*

P. I. No.	Name.	Oil in whole fruit.	Oil per average fruit.
		Per cent.	*mils.*
2687	Duncan grapefruit	0.115	0.53
1334	Pernambuco grapefruit	0.137	0.55
1635	Pineapple orange	0.143	0.19
1313	Ellen grapefruit	0.172	0.483
4121	McCarthy grapefruit	0.258	1.350
1706	Valencia orange	0.301	0.625
3660	Balanga orange	0.347	0.920
1714	Larrantta orange	0.360	0.525
2686	Pineapple orange	0.363	0.600
3383	*Citrus madurensis*	0.380	0.383
1631	Marsh grapefruit	0.487	1.600
1618	Sampson orange	0.510	0.766
1715	White siletta orange	0.600	0.730
5497	Gauid	0.638	0.862
5658	Camisan	0.663	0.937
2390	Igorot orange	0.660	2.500
1632	Triumph grapefruit	0.983	3.000
1259	Malta blood orange	1.000	1.05
1273	Satsumamikan mandarin	1.190	4.60

As has been previously mentioned the Philippines, excepting Cotabato Province, is very well adapted to citriculture. In spite of this fact, however, hundreds of thousands of pesos worth of pomelos, lemons, and oranges are imported annually into the Philippines from the United States, Italy, Spain, British East Indies, Dutch East Indies, Guam, Australasia, Australia, Canada, Japan, and China.

To verify this statement the data obtained from the Bureau of Commerce and Industry are here presented as Table 11.

TABLE 11.—*Annual imports of citrus fruits into the Philippine Islands for 1913 to 1923.*

Import and source.	Weight.	Value.
1913	*Kgs.*	*Pesos.*
Lemons:		
United States	35,571	9,274.00
Italy	106,977	16,880.00
Spain	20	2.00
Australasia	1,638	338.00
Total	144,206	26,494.00

TABLE 11.—*Annual imports of citrus fruits into the Philippine Islands for 1913 to 1923*—Continued.

Import and source.	Weight.	Value.
1913		
Oranges:	*Kgs.*	*Pesos.*
United States	75,151	16,158.00
China	229,572	12,444.00
British East Indies	1,056	56.00
Japan	19,370	1,818.00
Australia	4,868	1,260.00
Total	330,017	31,736.00
Grand total	------------	58,230.00
1914		
Lemons:		
United States	61,165	16,068.00
Guam	16	2.00
Italy	46,386	10,866.00
Australasia	518	160.00
Total	108,085	27,096.000
Oranges:		
United States	140,563	24,136.00
China	388,206	22,828.00
Japan	22,145	2,184.00
Australia	3,524	912.00
Total	554,438	50,060.00
Grand total	------------	77,156.00
1915		
Lemons:		
United States	126,903	23,522.00
Italy	5,000	1,066.00
Australasia	46	10.00
Total	131,949	24,598.00
Oranges:		
United States	147,149	26,229.00
China	355,225	22,025.00
Japan	31,461	3,225.00
Australia	781	208.00
Total	534,616	51,687.00
Grand total	------------	76,285.00
1916		
Lemons:		
United States	127,886	29,003.00
Australia	438	61.00
Total	128,324	29,064.00
Oranges:		
United States	196,231	38,492.00
China	628,386	33,499.00
Dutch East Indies	1,125	145.00
Japan	16,854	1,592.00
Total	842,596	73,728.00
Grand total	------------	102,792.00

TABLE 11.—*Annual imports of citrus fruits into the Philippine Islands for 1913 to 1923*—Continued.

Import and source.	Weight.	Value.
1917	*Kgs.*	*Pesos.*
Lemons:		
United States	117,210	32,309.00
Oranges:		
United States	236,529	48,674.00
Canada	1,850	320.00
China	332,737	21,316.00
British East Indies	73	2.00
Dutch East Indies	1,066	178.00
Japan	12,027	1,107.00
Total	584,282	71,597.00
Grand total	------------	103,906.00
1918		
Lemons:		
United States	76,332	29,575.00
China	401	56.00
Australia	183	19.00
Total	76,916	29,650.00
Oranges:		
United States	185,855	73,905.00
China	411,363	39,494.00
British East Indies	32	4.00
Japan	5,718	709.00
Australia	101	30.00
Total	603,069	114,142.00
Grand total	------------	143,792.00
1919		
Lemons:		
United States	110,644	33,472.00
China	718	79.00
Total	111,362	33,551.00
Oranges:		
United States	295,991	105,334.00
China	372,393	47,453.00
British East Indies	341	61.00
Japan	1,800	287.00
Total	670,525	153,135.00
Grand total	------------	186,686.00
1920		
Lemons:		
United States	170,911	50,765.00
Italy	2,530	770.00
China	256	294.00
Australia	1,986	350.00
Total	175,683	52,179.00

TABLE 11.—*Annual imports of citrus fruits into the Philippine Islands for 1913 to 1923*—Continued.

Import and source.	Weight.	Value.
1920	*Kgs.*	*Pesos.*
Oranges:		
United States	596,767	239,492.00
China	236,341	45,661.00
British East Indies	2,599	355.00
Japan	7,580	1,362.00
Australia	451	156.00
Total	843,738	287,026.00
Grand total		339,205.00
1921		
Lemons:		
United States	321,944	74,686.00
Italy	5,000	97.00
China	173	9.00
Total	327,117	74,792.00
Oranges:		
United States	1,022,007	300,129.00
Spain	500	65.00
China	1,139,892	136,643.00
British East Indies	771	129.00
Japan	12,382	1,846.00
Total	2,175,552	438,812.00
Grand total		513,604.00
1922		
Lemons:		
United States	177,951	60,458.00
China	1,283	456.00
Australia	1,100	320.00
Total	180,334	61,234.00
Oranges:		
United States	393,591	157,280.00
China	739,302	81,247.00
Japan	7,427	813.00
Australia	30,300	9,147.00
Total	1,170,620	248,487.00
Pomelos:		
United States	27	10.00
Spain	14	4.00
China	304,681	19,048.00
British East Indies	817	50.00
Japan	30	4.00
Total	305,569	19,116.00
Grand total		328,837.00

TABLE 11.—*Annual imports of citrus fruits into the Philippine Islands for 1913 to 1923*—Continued.

Import and source.	Weight.	Value.
1923	*Kgs.*	*Pesos.*
Lemons:		
United States	177,500	65,694.00
Italy	8,030	1,603.00
Canada	160	60.00
Total	185,690	67,357.00
Oranges:		
United States	1,167,496	334,306.00
China	815,360	99,194.00
British East Indies	1,140	131.00
Japan	5,890	943.00
Total	1,989,886	434,574.00
Pomelos:		
China	167,532	10,854.00
British East Indies	170	14.00
Total	167,702	10,868.00
Grand total		512,799.00

Considering the total amount of citrus fruits imported by the Philippines every year, as shown in Table 11, it would seem that the Filipinos are heavy consumers of citrus fruits. The yearly increase in the total value of citrus fruits imported indicates that the future demand will be far greater than is the present.

It is very unfortunate that the Philippines, with its climate and soil well suited to citriculture, must depend upon foreign countries for its supply of citrus fruits. Authorities on citriculture agree that if cultivation of the different kinds of citrus were given more attention here the Philippines would unquestionably produce equally good and possibly better fruits than those now being imported. With the exception of Batangas mandarins, however, the Philippine citrus fruits are classed as very poor. Wester[5] makes the following statement about Batangas mandarins:

> Perhaps nowhere else in the world have such superior mandarins been produced in such quantities and with so little care as in the so-called orange district of Batangas.

The Bureau of Agriculture is trying to help the Filipinos understand the value of employing proper methods of citrus cultivation. The Tanauan Commercial Citrus Station, situated in Tanauan, Batangas Province, employs trained men to demonstrate the modern and most profitable ways of citriculture; but, strange to say, despite this effort the Batangas orange orchards yield poorer crops every year, and are being transformed by their owners into coconut plantations. This is unfortunate; for, if proper ways of cultivation were used, the yields of citrus fruits could without any doubt be increased. There is always a steady normal market in Manila for citrus fruits, whereas that for coprax is somewhat unstable. By planting coconuts to take the place of oranges (already giving returns to the owner), capital will be wasted in that a good source of income is cut off and the owner will have to wait at least six years before he can expect any return from his coconut plantation.

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[5] Philip. Bur. Agr. Bull. No. 27 (1913) 9.

To encourage citriculture in the Philippines very many kinds of foreign citrus trees have been imported into the Islands and these are now growing at the Lamao Experiment Station, Lamao, Bataan Province. When Mr. Tanaka, a Japanese engaged in the study of citrus trees, came to the Philippines in 1923 to see the Lamao Experiment Station, he remarked that it has the most complete collection of citrus trees in the world.

We noted with pleasure, on a visit to Lamao Experiment Station, that some of the oranges and pomelos growing there are not at all inferior to the Chinese and California oranges in quality and sweetness, judging from the fruits we were privileged to sample. It is to be regretted that up to the present time not a single modern citrus orchard of private ownership can be found in the Philippines. The orchards in Tanauan, Batangas, which supply the Manila markets with oranges and mandarins, furnish conclusive proof of mismanagement and neglect on the part of our citrus growers. Too closely planted citrus trees, which are the hosts not only of disease, but of different plant parasites as well, are not an uncommon sight in orange districts. Wester,[6] in a discussion of citriculture in the Philippines, says—

> the first modern citrus orchard intelligently laid out and cared for is still to be planted in the Philippines.

Cavite is the only province that may in the near future compete with Batangas in the production of citrus fruits. Information from the Bureau of Agriculture is to the effect that Cavite orders citrus budded plants and seedlings by the thousands and oftentimes that bureau is not able to supply the demand.

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[6] Philip. Bur. Agr. Bull. No. 27 (1913) 9.

When Philippine farmers begin to realize the innumerable ways in which the many varieties of citrus serve us and the world as a whole, they will certainly regret having neglected an important industry which could have brought wealth to them and to the Philippines. If they could be made to understand that the hundreds of thousands of pesos expended for oranges, lemons, pomelos, citric acid, bitter orange peel, sweet orange peel and its tinctures, and the different oils that are annually being imported could be used for the extension and development of Philippine agricultural resources, they would possibly awaken to the advantages of citriculture at home.

The following citrus species are recommended by the Bureau of Agriculture for planting, taking into consideration productivity, quality, and flavor of the fruit. The numbers are the plant introduction numbers of the Bureau of Agriculture.

Citrus sinensis:
2568. Misamis.
3660. Balanga.
4119. Dugat.
1635. Pineapple.
2686. Pineapple.
4124. Carleton.
1259. Malta blood.
1270. St. Michael.
4123. Magnum bonum.
2694. Majorca.
1705. Mediterranean.
1636. Washington navel.
2689. Enterprise.
3886. Du Roi.
1260. Excelsior.
1719. Jaffa.
56. Jaffa.
1714. Larrantta.
1728. Cuyo.
1715. White siletta.
2698. Boone.
1720. Bahia.
2691. Homosassa.

Citrus aurantifolia:
3670. Trinidad.
3669. Everglade.

Citrus maxima:
3673. Siamese.
3442. Siamese.
3391. Yugelar.
1631. Triumph.
1713. Triumph.

Citrus nobilis:
1271. Kishiu.

Citrus mitis:
2513. Kalamondin.
2255. Kalamondin.
2332. Kalamondin.

USES OF CITRUS FRUITS

The uses of citrus fruits are many and are as follows:

Root.—The root of *Citrus acida* is one of the principal ingredients in a preparation of iron called "Yakridari lauha" used by the natives of India as a medicine.[7] The bark of the roots has also been used in the West Indies as a febrifuge.

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[7] Pharm. Indica 1 (1889–1890) 270.

Gum.—In Brazil, a gum which exudes in quantity from the trunk of a kind of pomelo, *Citrus maxima,* when it begins to decay, is used as a remedy for coughs. In the Philippines the gummy exudate of the tree is used in kidney and bladder disorders.

Leaves.—An infusion made from orange leaves is used by the Filipinos in an ailment called "mal de madre." Orange leaves are official in the Swiss and Spanish Pharmacopœias. The leaves of lemon have alexipharmic properties. Besides being used for medicinal purposes the leaves are also used as flavoring in homemade *patis.*[8] Many Filipinos use the leaves in the well-known *gogo* shampoo.[9]

Flowers.—A tea made from orange flowers is commonly used in French domestic medicine. Water distilled from orange flowers is employed as an antispasmodic and as a sedative in nervous and lupteric cases.[10] Orange flower sirup, orange flower water, and stronger orange flower water are official preparations from orange flowers, in the United States Pharmacopœia. The orange-flower waters are used as a pleasant lotion and as a vehicle for other drugs. The oil of orange flowers, often called oil of neroli, a volatile oil distilled from the fresh flowers of the bitter orange, *Citrus aurantium amara* Linnæus, is official in the National Formulary. Oil of neroli is used almost exclusively in making perfumery, but in the form of orange flower it serves as a flavoring agent in sirups, elixirs, etc.

Fruits.—The seeds of lemons have tonic and antiseptic properties. They form one of the important constituents in cocimiento antiseptico (decoctum antisepticum) and cocimiento antiseptico purgante (decoctum antisepticum purgans), official preparations in the Spanish Pharmacopœia.

Orange pulp as well as lemon, pomelo, and grapefruit pulps furnish good material for paper making. Dovey[11] experimented in 1911 in making paper from citrus fruit pulp. His method was simply agitating the pulp with water and discarding the seeds that settled at the bottom; the pulp was disintegrated with bleaching powder and then passed through a sieve; from this, sheets of paper were made by hand. The paper was semitransparent and waterproof and resembled a film of gelatin. Writing or printing was legible. With the use of simple and inexpensive machinery probably a very useful transparent and waterproof paper could be made of this pulp.

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[8] A kind of sauce prepared from fish or shrimps.

[9] Made from the pounded bark and trunk of the gogo vine, *Entada scandens* Bentham.

[10] Pharm. Indica 1 (1889–1890) 270–271.

[11] Philip. Journ. Sci. § A 7 (1912) 411.

Volatile oils are obtained from the peelings of the different varieties of citrus. Oil of lemon and oil of sweet orange are official in the United States Pharmacopœia, and oil of bitter orange is official in the National Formulary. Bitter orange peel, sweet orange peel, and lemon peel are also official in the United States Pharmacopœia.

Oil of lemon is valued according to its aldehyde content; the United States Pharmacopœia requires not less than 4 per cent of aldehyde calculated as citral. Oil of lemon possesses stimulant and aromatic properties, but it is usually employed in medicine to impart an agreeable odor to preparations.

Oil of orange is about 90 per cent limonene. About 5 per cent of the remainder consists of the principal odor bearers, such as citral and citronellal. The oil is used in medicine to assist in disguising the disagreeable taste of medicaments. In small amounts it is also used to relieve nausea and colic. The peel of oranges is used in medicine as a carminative or a stomachic. In small doses it is used in nausea and colic. Fresh rind is rubbed on the face by people suffering from acne. The rind is mixed with water and then rubbed on a part affected with eczema. Orange peel is useful for checking vomiting and destroying intestinal worms.[12] The preparations made from orange peel recognized by the United States Pharmacopœia are the following: Fluid extract of bitter orange peel, tincture of bitter orange peel, tincture of sweet orange peel, and sirup of orange. Compound wine of orange is recognized by the National Formulary. Other preparations made from orange peel mentioned by the National Dispensatory are infusion of orange peel and compound infusion of orange peel.

The peelings of oranges contain the following, which account for the bitter taste: Naringin (de Virjs hesperidin or aurantin), aurantimarin, isohesperidin (glucosides), and aurantimaric acid, a resinous substance. Dried flowers of pomelo contain 2 per cent hesperidin.

Lemon peel is a stimulant stomachic and is also used in preparations to increase their efficacy and modify their taste.

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[12] Pharm. Indica 1 (1889–1890) 271.

Tincture of lemon peel is recognized by the United States Pharmacopœia. The tincture enters into the manufacture of several flavoring preparations.

Lemon juice, orange juice, and the juices of citrus varieties are used for medicine and for food. Lemon juice has been recommended in rheumatic fever and in catarrhal jaundice. In the form of lemonade it affords an excellent beverage during the course of acute febrile affections. In India the juice is used for the relief of dyspepsia with vomiting. Gibson [13] says that the fruit of common sour limes, eaten daily with salt, is a remedy of the utmost importance in enlargement of the spleen. Aitkin [14] reports that a decoction of lemon is a valuable remedy in the treatment of ague. Lemon juice is also useful in bilious headache and vomiting caused by excess of bile, and in purifying the blood of scorbutic patients. With honey it is often used for alleviating sore throat and coughs. It has some digestive properties. In Bengal a pickle is made from lemon fruit and used for the the relief of indigestion. The pickle is made by rubbing the fruit on a stone or by scraping the rind; it is then steeped in juice obtained from other lemon fruit, to which has been added a little salt. Then the steeped fruit is exposed to the sun for a few days. When crisp and of a brown color the fruits are preserved in a jar. This preparation is called "jarak nebu," which means digestive lemon. The juice is also used as an antidote to some acro-narcotic poisons.

In 1912 Gibbs and Agcaoili [15] made investigations as to the possibilities of bottling orange, lemon, and other citrus fruit juices. They made about seventy bottles of orange juice with varying amounts of sugar. Sterilization was effected by immersing the stoppered bottles in boiling water for a period of from forty-five minutes to two hours. Some of the bottled juice was sterilized by filtration through a Berkefeld filter. Juices bottled with 15 per cent sugar proved to be the best. The juice kept for years. At about the same time they also made a distilled beverage from fermented and distilled juices. The flavor of the beverage was very good and improved by aging in wood for a short period. From the success of their experiments we may accept the idea that the industry of bottling Philippine citrus fruit juices would prove profitable, especially when it is remembered that the pulp which will form

[13] Pharm. Indica 1 (1889–1890) 273.

[14] Brit. Med. Journ. (October 4, 1884) 653.

[15] Philip. Journ. Sci. § A 7 (1912) 408–410.

as a by-product can be made into paper and that the oil extracted from the peelings will also be of commercial importance.

The juices of many Philippine citrus fruits, especially those of limes, are sources of citric acid, official in the United States Pharmacopœia. If the growing of Tahiti, Trinidad limes, and Biasong be encouraged, the Philippines will be able to decrease the imports of another product, namely, citric acid, which is very widely used in medicine. Citric acid increases the acidity of urine and the coagulability of the blood in scurvy, in which disease it is the best remedy for prophylactic and curative treatment. The importance of citric acid in pharmacy will be appreciated if the number of preparations in the United States Pharmacopœia of which it is a constituent part is considered. These are: solution of magnesium citrate; citrate caffein; syrup of citric acid; solution of potassium citrate; effervescent potassium citrate; ammonium ferric citrate; iron and quinine citrate; lithium citrate; potassium citrate; sodium citrate and many others mentioned by the National Dispensatory.

CONCLUSIONS

The commercial uses of citrus fruits as well as their uses in pharmacy and medicine have been pointed out, and the suitability of the Philippines for their cultivation, the possibilities in paper making and in bottling citrus juices, and the commercial value of the oils from the different varieties have been explained. Citriculture should by all means be encouraged so that the Philippines, instead of being an importer will become the leading producer and exporter of the various citrus fruits, bottled citrus juices, perfumes, orange peel, orange oil, lemon peel, lemon oil, citric acid, oil of neroli, and the many pharmaceutical preparations made from these.

ILLUSTRATIONS

PLATE 1

Chart showing sucrose, reducing sugars, and citric acid in fruits from various species and varieties of citrus.

PLATE 2

FIG. 1. Balanga orange. P. I. No. 3660.
2. Boone orange. P. I. No. 2698.
3. Igorot orange. P. I. No. 2340.
4. Larrantta orange. P. I. No. 1714.
5. Majorca orange.

PLATE 3

FIG. 1. Malta blood orange. P. I. No. 1259.
2. Pineapple orange. P. I. No. 1635.
3. Pineapple orange. P. I. No. 2686.
4. Pongkan orange. P. I. No. 5177.
5. Sampson orange. P. I. No. 1618.

PLATE 4

FIG. 1. Sour orange. P. I. No. 1638.
2. White siletta orange. P. I. No. 1715.
3. Duncan grapefruit. P. I. No. 2687.
4. Ellen grapefruit. P. I. No. 1313.
5. Marsh grapefruit. P. I. No. 1631.

PLATE 5

FIG. 1. McCarthy grapefruit. P. I. No. 4121.
2. Pernambuco grapefruit. P. I. No. 1334.
3. Triumph grapefruit. P. I. No. 1632.
4. Everglade lime. P. I. No. 3669.
5. Lemon. P. I. No. 5175.

PLATE 6

FIG. 1. Gauid. P. I. No. 5497.
2. Camisan. P. I. No. 5658.
3. Lombog. P. I. No. 4827.
4. Satsumamikan mandarin. P. I. No. 1273.
5. Suangui. P. I. No. 5165.
6. *Citrus madurensis*. P. I. No. 3383.

TEXT FIGURES

FIG. 1. Chart showing percentage and quantity of oil per average fruit of various species and varieties of citrus.
2. Diagram showing graphically the quantity of juice, pulp, seed, and peeling in the fruit of various species and varieties of citrus.

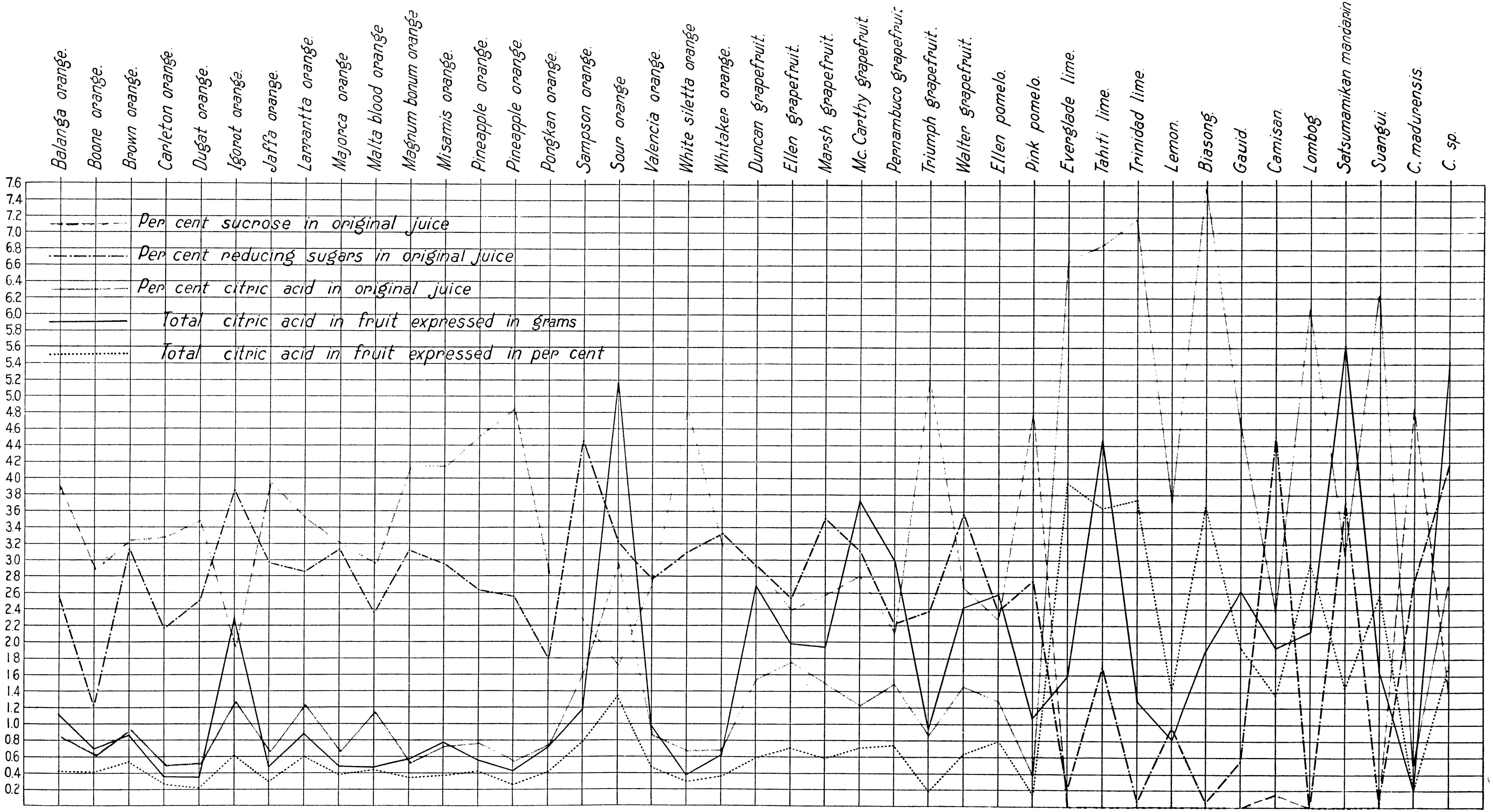

PLATE 1. SUCROSE, REDUCING SUGARS, AND CITRIC ACID IN CITRUS FRUITS.

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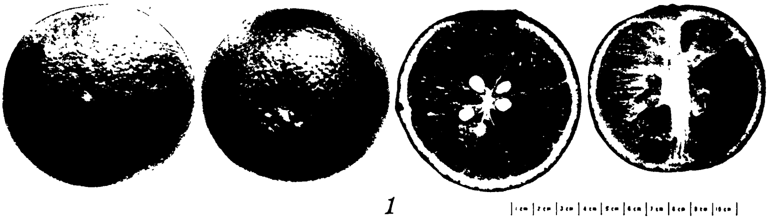

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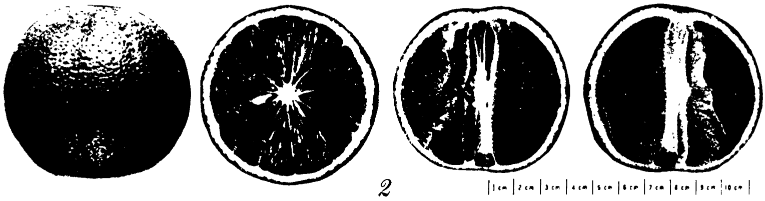

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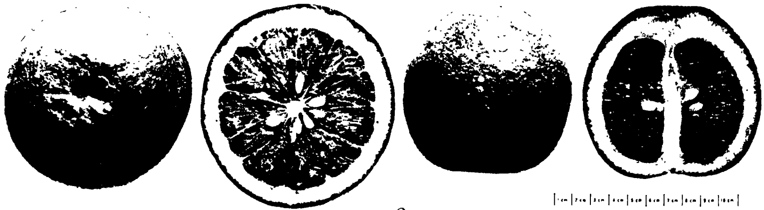

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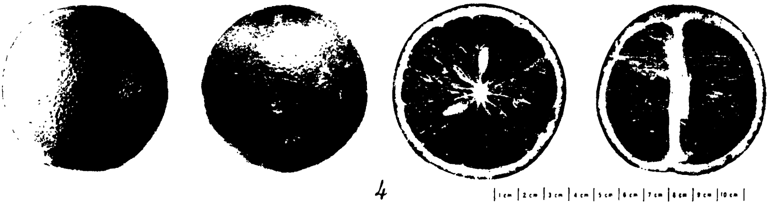

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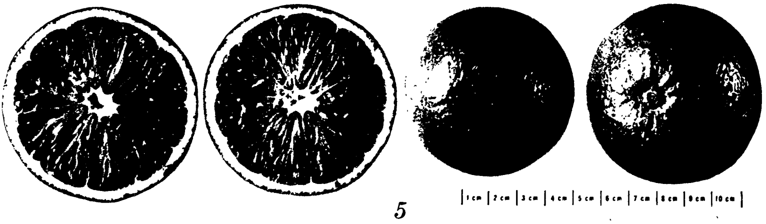

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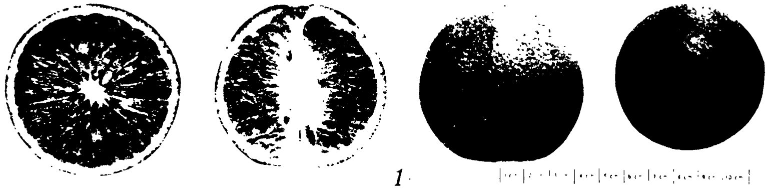

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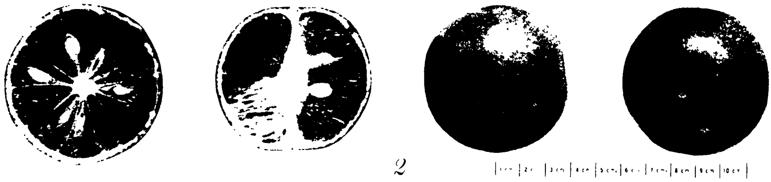

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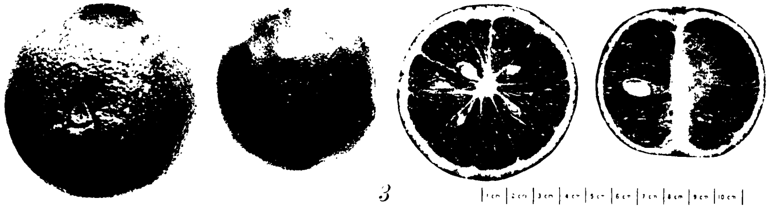

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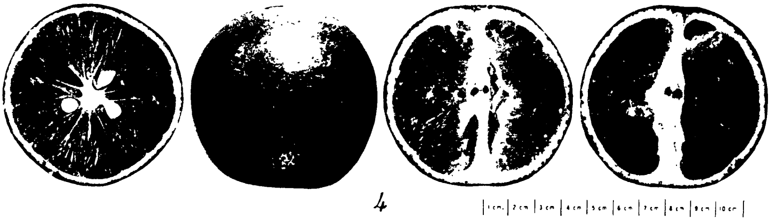

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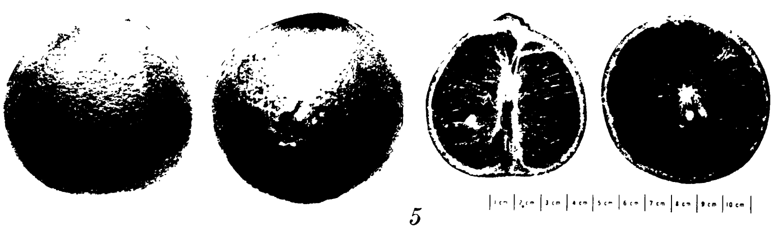

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PLATE 3.

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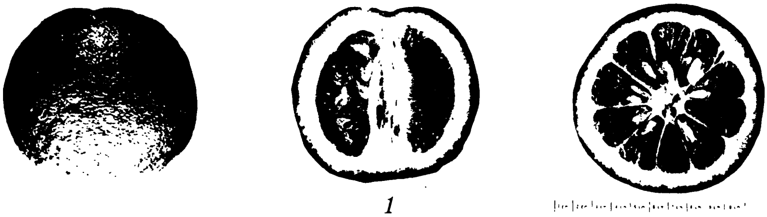

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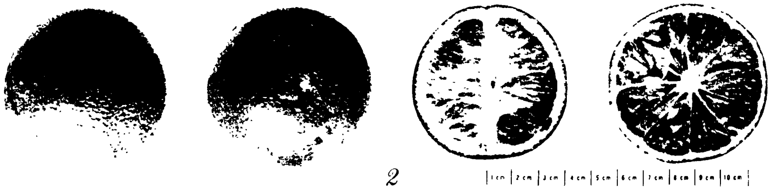

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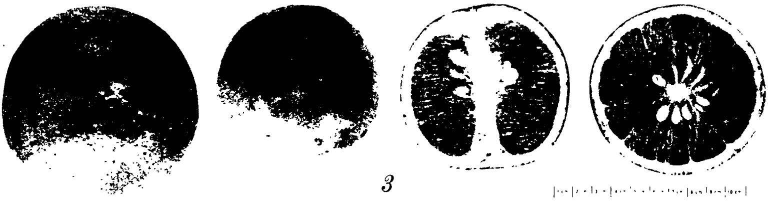

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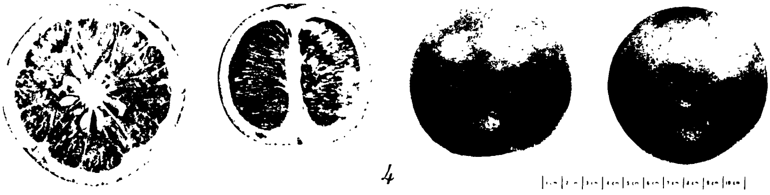

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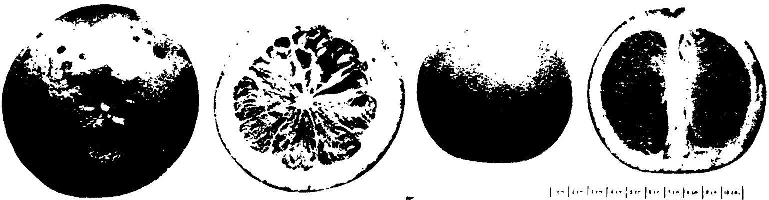

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PLATE 4.

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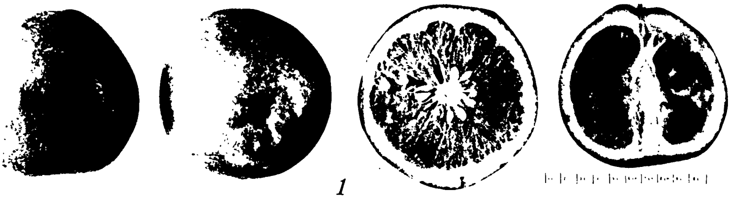

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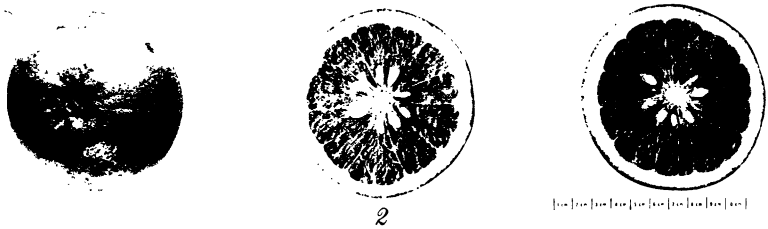

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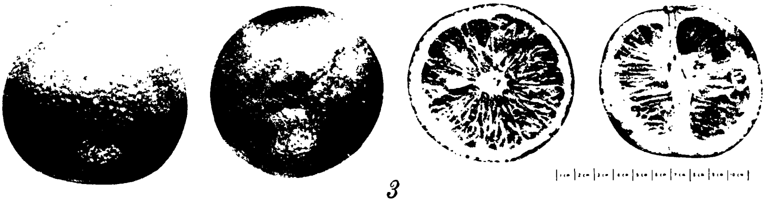

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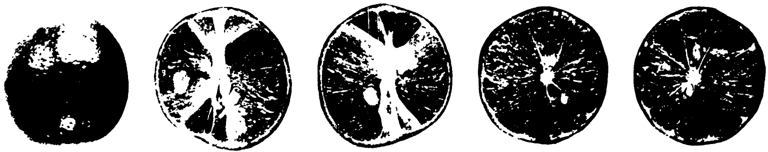

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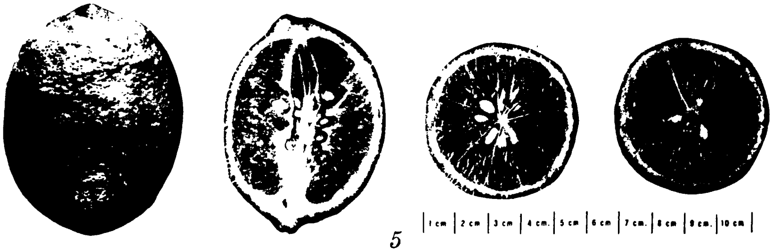

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PLATE 5.

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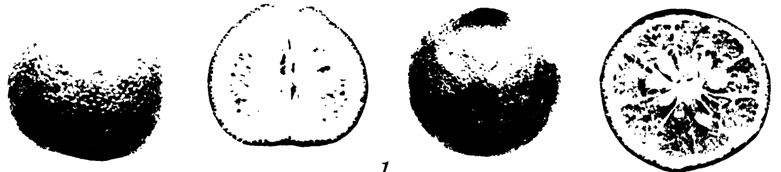

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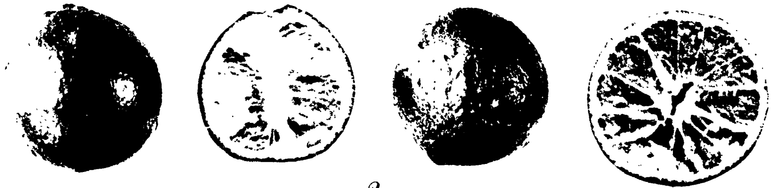

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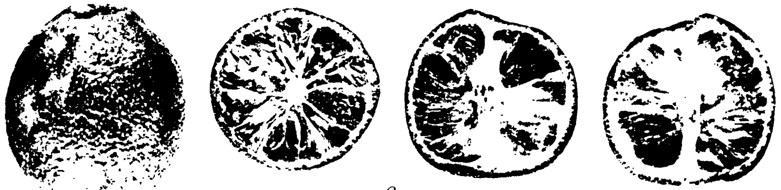

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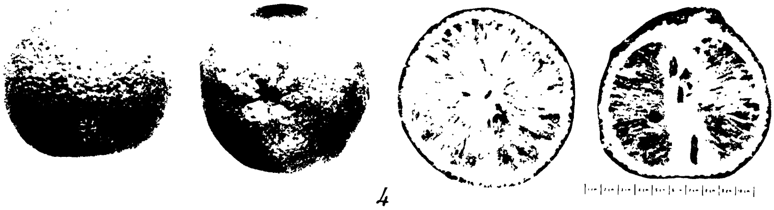

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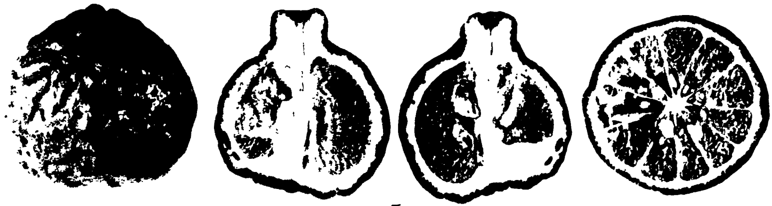

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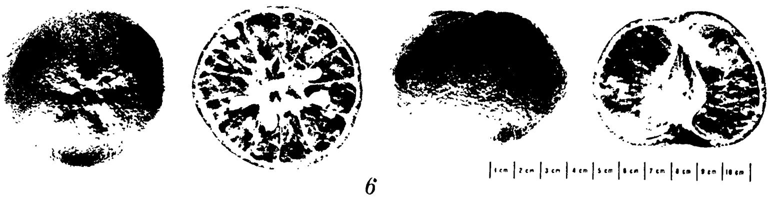

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PLATE 6

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A PHARMACOGNOSTICAL STUDY OF CHENOPODIUM AMBROSIOIDES LINNÆUS FROM THE PHILIPPINES

By José K. Santos

Of the Department of Botany, University of the Philippines and Bureau of Science

FIVE PLATES

Of the genus *Chenopodium,* which comprises about fifty species distributed in various regions of the world, only two or three species are particularly interesting on account of the medicinal value of the volatile oil obtained from them, and three or more other species because of their food value. The knowledge of the virtue of the oil of chenopodium as a medicine for expelling intestinal worms can be traced for many years. Schüffner and Vervoort(12) claim that this oil is superior even to thymol, beta-naphthol, or eucalyptus. In their comparative studies upon various drugs for the treatment of hookworm infection they determined the "coefficient of efficacy" of each to be as follows: Oil of eucalyptus, 38; beta-naphthol, 68; thymol, 83; oil of chenopodium, 91. Their results were strongly supported by the many cases observed and reported by Levy,(6) assistant resident physician of Johns Hopkins Hospital.

The oil of chenopodium, or oil of American wormseed, which is readily obtained by distillation, is official in the United States Pharmacopœia IX as *Oleum chenopodii.* The fruit of *Chenopodium* was formerly official but was dropped from the United States Pharmacopœia in 1900.

The chemical constituents and the pharmacological and therapeutical properties of the oil of chenopodium have been extensively worked out during the latter part of the present century, especially during the period of the World War. The most important components of the oil are cymene and ascaridol; the latter was first isolated by Schimmel and Company,(11) who gave it the name "ascaridol." They believed the anthelmintic action of the oil to be due to this compound. Livingston(7) has definitely shown that ascaridol is the most toxic component of the oil. Kobert,(5) on the other hand, claims that the anthelmintic action of the powdered drug is due to the presence of the two saponin bodies as well as to the essential oil. These two saponin bodies were detected by him in the herbs and seeds, in his investigations of the plant.

The principal source of the oil is the mature plant of *Chenopodium ambrosioides* var. *anthelminticum* A. Gray, which is extensively cultivated in Maryland (particularly near Baltimore) and in Missouri.

Aug. Chevalier (2) describes two varieties of *Chenopodium ambrosioides* as important sources of the oil of chenopodium; the variety *anthelminticum* A. Gray = *C. anthelminticum* Linnæus = *C. ambrosioides* Linnæus subsp. *anthelminticum* Thellung, and the variety *santamaria* A. Chev. = *C. santamaria* Vellozo de Miranda. He also points out that the oil obtained from the following species has the same anthelmintic properties: *Chenopodium ambrosioides* Linnæus, *C. botrys* Linnæus, *C. multifidum* Linnæus, and *C. chilense* Schrader.

In China, *Chenopodium album* Linnæus, known as *jui-t'iao* or *jui-hsien*, is described in the Chinese Materia Medica (15) as having medicinal properties. Thus, the stalk and the leaves of the plant are thought to have insecticidal properties, and they are also used in cases of insect stings and bites; the seeds are eaten as an anthelmintic remedy, and the expressed juice is used for eradicating freckles and sunburn.

However, Pynaert (9) considers the following species as important sources of the oil of chenopodium: *Chenopodium ambrosioides* Linnæus, *C. ambrosioides* var. *anthelminticum* A. Gray = (*C. anthelminticum* Linnæus), and *C. suffruticosum* Willdenow. Of these only *C. ambrosioides* Linnæus is found in the Philippines, where it is widely distributed. It constitutes the most available local source of oil of chenopodium and, therefore, it seemed that a thorough investigation as to what part of the plant might be best used for distillation of the oil was desirable. Recently Jimenez (4) distilled the oil from *Chenopodium ambrosioides* Linnæus, growing in the Philippines. In his unpublished paper, read before the Convention of the Philippine Pharmaceutical Association in 1922, he claims that the oil obtained by him is identical with the oil isolated from the var. *anthelminticum*.

Microchemical detection of the oil.—As *Chenopodium ambrosioides* Linnæus owes its curative properties to the presence of a volatile oil, and since there are somewhat conflicting ideas with respect to the parts to be used in its preparation, a microscopical study of the plant was undertaken with the purpose of getting more or less definite information about the part or parts in which the oil is secreted and stored abundantly. The various parts of the plant were examined critically. Sections of the leaf, the young and the old portions of the stem, the open and the unopened flowers, the fruits, and the seeds were made and treated with some of the important reagents commonly used for the microchemical detection of essential oils in general. The following were used: Five per cent solution of potassium hydroxide in 95 per cent alcohol, freshly prepared alkanet tincture, osmic acid, Sudan red, and aqueous solution of copper acetate. Among these reagents the first, Wirth's(16) alcoholic potash, gave the best results. The reaction consists in the gradual change of color of the oil from a deep yellow to various shades of orange, then to deep red, and finally to dark reddish brown. The time observed for the whole reaction is very much shorter than that given by Wirth(16) for the variety *anthelminticum,* perhaps due to the fact that room temperature is higher in the Philippines than in the United States. The change in color of the oil was noticed in from two to three minutes after the addition of the reagent. The advantage of this reagent over the others lies in the fact that the reaction is much more rapid, perhaps due to its destructive effect on the cell walls, thus allowing it to reach the oil quickly. Its disadvantage is that, if the aldehydes are not completely removed or eliminated, judgment of the change in colors is very unsafe.

The alkanet tincture was next in efficiency to the alcoholic potash. This reagent also gave satisfactory results, particularly with the oil found in the embryo. It does not readily react with the oil stored in the uninjured glands, but if the walls of the glands are broken the reaction is observed, thus showing that the cutinized walls of the glandular hairs retard the penetration of the alkanet. However, if the glands are left very long in the alkanet tincture a slow reaction is obtained. The disadvantage of this reagent is that it dissolves the oil and the color disappears. Osmic acid and Sudan red gave good results also, but the aqueous solution of copper acetate failed to give any. As controls, tests were made on the oil prepared by Eimer, Amend and Company, New York, and practically the same results were obtained.

General characters of the hairs.—Two distinct kinds of hair are observed in *Chenopodium ambrosioides* Linnæus, both of the multicellular type. They are seated either on one prominent epidermal cell or between two such cells. Only one type of hair secretes and stores the oil, and this is considered by Solereder(13) as the true glandular hair (Plate 2, figs. 24*a* to 24*f*). It is composed of a basal portion consisting of two or more superimposed cells, which have rather thick walls and sometimes in the younger stage contain chloroplastids and dense protoplasm; and of a unicellular, strongly developed, glandular head, about 0.126 millimeter long and 0.054 in diameter, in which oil is found. The glandular oil-containing hair is easily distinguished from the one not containing oil by its terminal cell, which is slightly oblong-ovoid and is attached by one end to the basal cell; the cells of the basal portion of the hair are so arranged that the terminal cell forms an angle with the outer surface of the epidermis, frequently of 45° to 60°; and when the hair is in a depression the terminal cell may be parallel with the epidermis as shown in Plate 1, figs. 24*a* to 24*f* and 26, whereas in the hair not containing oil the terminal cell is very much elongated, about 0.3 to 0.4 millimeter long and 0.014 to 0.015 in diameter, and is more or less cylindrical. It is usually attached near one end to the basal cells in such a way that it forms a hair with unequal arms and is scythe-shaped, as represented in Plate 2, figs. 23*a* to 23*e*. The glandular oil-containing hair is distinguished further from the other type by the fact that the former is yellowish or greenish yellow, whereas the latter is colorless and transparent. Solereder(13) describes the two types of hair found in *Chenopodium ambrosioides* Linnæus as approaching a bladderlike type.

A comparative study of the number and distribution of the two kinds of hair, on cultivated plants which were well watered every day and on plants growing wild in a rather dry place, showed that the cultivated ones had fewer glandular hairs than had those in the dry places, and that in the cultivated plants the hairs were mostly confined to the lower side of the leaf and to the fruits, whereas on the wild plants glandular hairs were abundant on both sides of the leaf as well as on the fruits and young stems.

The flower.—The flowers of *Chenopodium ambrosioides* Linnæus are very minute; before opening they measure only from 0.5 to 0.8 millimeter in diameter. They are mostly perfect and regular, but some are unisexual. The perianth consists of a calyx only, green or sometimes reddish or purplish at the tip of the calyx lobes. These lobes of the calyx are united about halfway from the base, and the five yellow anthers protrude through the opening at the summit of the calyx, as indicated in

Plate 1, fig. 5. The bisexual flower is distinguished from the unisexual one even before opening by its larger size and more-regular shape; it is usually more or less spherical, with the calyx lobes somewhat elliptical in outline in dorsal view. The unisexual flower is smaller and somewhat irregular in shape, and the outline in dorsal view of the calyx lobes is ovate and slightly tapering at the tip. This difference is rather prominent in Plate 1, fig. 3, showing a unisexual flower, and in fig. 4, showing a bisexual flower, both at the stage before opening. An examination of the flowers at this stage showed many hairs scattered on the outer surface of the calyx and of the ovary. The two types of hair, the saclike and the scythe-shaped, are found on the dorsal surface of the calyx. Microchemical test reveals that the hairs of the first type contain oil, while those of the second do not. The upper half of the outer surface of the ovary is covered with a mass of only one kind of hair; namely, the glandular hair, which contains oil. Plate 1, fig. 8, represents a very young ovary dissected from a young flower; fig. 9 is of an older one taken from a flower just opened, about the same stage as in fig. 5; and fig. 10 is drawn from a young fruit. Evidently there are comparatively fewer glandular hairs in the younger stage than at the time when the flowers are opened. At this stage most of the glands are fully developed, and perhaps the amount of oil present in the hairs is greater than at the time the fruit is ripe. During the development of the embryo the calyx becomes irregularly thickened and gradually incloses the ovary. At this stage, as represented in Plate 1, fig. 10, most of the glandular hairs seem to have dried up or to be shrunken and collapsed. Whether this shrinkage of the hairs is simply due to evaporation, or to the pressure produced by the thickened calyx lobes that inclose it and by which some of the oil is squeezed from the glands and then evaporated, or to the condensation of the oil, or to intramolecular changes in the oil would be an interesting problem for investigation. Wirth,(16) who worked with *Chenopodium ambrosioides* var. *anthelminticum*, has the following to say in his paper:

> It would be an interesting experiment which might bring to light some important facts, to distill the oil from the plants in the flowering stage. Such an experiment would at least tend to show whether the cymene present in the oil distilled from the fruits was originally present, or was formed as a decomposition product of the ascaridol, upon the development of the fruit. There is, of course, the possibility that the oil in the flowers has higher ascaridol content than that distilled from the plant at a later stage. If this is true an important error lies in the

time of distillation; in fact, none of the work upon the distillation of plant products should be conducted without a previous knowledge of the changes in structure of the ovary, and constituents of the oil, until the time of maturity of the fruit.

The fruit.—For many years the fruit has been considered as the important part of the plant and the principal source of the oil of chenopodium. In fact, as indicated above, it was formerly classified as an official drug in the United States Pharmacopœia IX but was dropped from the edition of 1900. However, as the oil is prepared largely from the fruit, a more-critical investigation based upon a morphological, histological, and microchemical study seems to be of considerable interest. The fruit is more or less globular, with five distinct rounded ridges, of about the size of a pinhead, or a diameter of from 1 to 1.5 millimeters (Plate 1, fig. 6). When matured it is bright green or sometimes greenish yellow, and consists of a one-seeded utricle or achenelike fruit with thin, hyaline pericarp, and is loosely enveloped in a five-parted, irregularly thickened calyx. The fruits are generally arranged in clusters in spike panicles as illustrated in Plate 1, figs. 1 and 2, and when completely mature readily fall from the stalks. The calyx, which constitutes the fleshy part of the fruit, is persistent; and the five sepals, which are partially united in the flower and become united at the summit as well as along the margins during the development of the fruit, entirely inclose the pericarp, which closely adheres to the seed. When the calyx is young it is thin and the dorsal surface is somewhat smooth but bears some hairs; when it becomes older it gradually thickens and its dorsal surface is verrucose and most of the hairs disappear (Plate 1, fig. 6). A surface section of this region (Plate 2, fig. 24) shows that the cells are thin-walled, irregular, and more or less wavy in outline. They are smaller and less wavy than the epidermal cells of the leaf or those of the pericarp. Numerous stomata are present. The epidermal cells of the ventral side, however, do not have stomata, and are more wavy in outline and have thinner walls than those of the dorsal side. In a longitudinal section through the calyx, the epidermis of both dorsal and ventral sides consists of a single layer of cells, but the cells of the outer epidermis are slightly cutinized, larger, have thicker walls, and are less elongated than the cells of the inner or ventral epidermis, which are not cutinized. The mesophyll consists of two layers of palisade chlorenchyma or assimilatory tissue and ten to twelve rows of cells that are somewhat elongated and have a more or less regular form; those toward the dorsal side are provided with some chloroplastids, while those toward the ventral side do not possess any, and many of them are practically filled with microcrystals of calcium oxalate. These are sometimes in rosette form. The individual crystals have a triangular or arrow shape and are very minute, less than 0.001 millimeter in length. Plate 2, fig. 25, represents two cells from the mesophyll with microcrystals of calcium oxalate. According to Molisch(8) the Chenopodiaceæ in general may contain, in addition to calcium oxalate, a solution of oxalates, which may be detected by precipitation with saturated alcoholic sodium hydroxide, saturated alcoholic potassium hydroxide, lead acetate, or barium chloride. A microchemical test, using these reagents, has shown that a solution of oxalate is present in *Chenopodium ambrosioides*. Plate 1, fig. 7, is a diagrammatic longitudinal section of a young fruit illustrating the more or less horizontal position of the seed, which is completely surrounded by the thin pericarp, the position of the grandular hairs, the distribution of the regions or area in which the microcrystals occur, and the two or three rows of spiral tracheary cells.

The pericarp.—The pericarp is very thin and hyaline and completely surrounds the seed. The parts can be studied better in the younger stages while the cells are turgid and the protoplasm is dense. It apparently consists of three layers of cells (Plate 2, fig. 16). According to Wirth,(16) however, in the var. *anthelminticum* the pericarp consists of two layers, an "epicarp" and an "endocarp," which resemble each other in size and outline. In *Chenopodium ambrosioides* Linnæus the outer and inner layers are separated by an incomplete layer of cells consisting of somewhat ovoid or rounded cells, between which are large intercellular spaces (Plate 2, fig. 16). When the pericarp becomes older the cell walls of the outer epidermis are thickened, and those of the inner epidermis and the cells between the two layers of epidermis collapse, so that eventually the pericarp appears very thin and as if composed of a single layer of cells. The lower part, however, near the base is much thicker and may consist of three or more layers of cells, and it is sometimes provided with tracheary cells. The cells of the outer and inner epidermis of the pericarp are very irregular and somewhat elongated and wavy in outline. Those near the base of the glandular hairs (Plate 2, fig. 18) have thicker walls than do the others. The upper half of the pericarp bears a large mass of glandular hairs, and microchemical tests proved that all of these hairs contain oil.

The seed.—The position of the seed in the fruit, about which there are somewhat contradictory statements, is interesting. It is generally found in a horizontal position, or sometimes in a somewhat inclined position, and in a very few cases is erect or vertical. It is lentil-shaped, jet black and glistening when fully matured, and from 0.8 to 1 millimeter in diameter and from 0.3 to 0.6 in thickness. A median section of the seed shows that the embryo is coiled almost entirely around the endosperm. The seed coat consists of from two to four layers of cells. The outer layer, commonly known as the testa, is composed of a single layer of thick-walled cells, which are brown and are heavily cutinized. In a surface section these cells appear in rows in some places and in others they are irregularly arranged and have a somewhat wavy contour. The three inner layers which compose the tegmen are compressed and collapsed, have thinner walls, and are yellow. The endosperm is composed of parenchyma cells which are filled with spherical starch grains found in clusters. These starch grains are very minute, from 0.0008 to 0.001 millimeter in diameter (Plate 2, fig. 17). A microchemical test failed to show the presence of oil in the endosperm, but in the embryo oil was found to be rather abundant. Tincture of alkanet gives the best reaction, but immediate results are also obtained with the other reagent used. According to Wirth,(16) however, there is some fixed oil in the endosperm of the var. *anthelminticum.*

Structure of the leaf.—As pointed out by Solereder,(13) the leaf structure of the Chenopodiaceæ shows a great diversity of anatomical characters, and these characters were found to be correlated with the habitat of the members of the group. Variation was observed particularly in the mesophyll, which in many cases is differentiated into assimilatory and aqueous tissue. He described various interesting cases based on Volkens's investigations. The following are among the members of the Chenopodiaceæ that have been worked out and that showed variation:

Rhagodia billardieri R. Brown.
Bassia.
Kochia.
Chenolea.
Panderia.
Kirilowia.
Atriplex.
Halimus.
Traganum.
Halogeton.
Salsola.

The mesophyll of *Chenopodium ambrosioides,* however, seems not to show distinct variation. A cross section of the leaf of *Chenopodium ambrosioides* showed that it has no uniform thickness; in certain places depressions were observed (Plate 2, fig. 26). It is in these depressions that the glandular oil-containing hairs are located. The upper epidermis consists of a single layer of cells that have more or less undulated margins and are slightly cutinized (Plate 3, fig. 28). The lower epidermis also consists of a layer of cells, but with very much thinner walls than those in the upper epidermis and they are very much smaller (Plate 3, fig. 27). Palisade chlorenchyma is found on both sides of the leaf. The upper palisade chlorenchyma found just below the upper epidermis may consist of a single layer or of two layers of cells containing a large number of chloroplastids; some cells contain calcium oxalate crystals in rosette form. The upper palisade occupies almost half of the region. The cells of the lower palisade chlorenchyma are very much shorter and smaller than are those in the upper palisades, and they contain fewer chloroplastids. The region occupied by them is comparatively very much narrower. About one-third of the cross section of the mesophyll is occupied by the spongy chlorenchyma. The cells in this region are more or less rounded, but are sometimes elongated and irregular in shape. They are of two kinds, one containing a few chloroplastids, and the other none. Those of the latter kind are usually more elongated than are those containing chloroplastids, and are arranged in a single row. The veins are also surrounded by cells of this type, which are classified as aqueous tissue. The spongy cells are not very loosely arranged, and the air spaces between them are not very large. Stomata are present on both sides of the leaf, but they are more numerous on the lower surface. The hairs, both the saclike and the sickle-shaped or scythe-shaped, are mostly confined to the lower surface of the leaf, though occasionally they may be found also on the upper surface. If a finger is passed over the lower surface of the leaf the characteristic smell of the oil is detected; whereas, if it is passed over the upper surface, only a slight odor can be observed.

The midrib is rather characteristic in that the upper and lower parts contain no strongly developed collenchyma cells and the vascular tissue consists of from four to eight bundles or groups, arranged in the general form of a ring (Plate 3, fig. 27). Exterior of the phloëm there are one or two layers of collenchyma almost surrounding the set of bundles. This anomalous position of the collenchyma cells is rarely observed in plant leaves. On the sides of the midrib there are two or more layers of chlorophyllous tissue or cells containing chlorophyll. Above, on both sides of the mibdrib, they extend from the palisade chlorenchyma to the collenchyma region, whereas below they reach from the spongy regions to the collenchyma. The last-named chlorophyllous cells seem to be a continuation of the lower palisade chlorenchyma, but in most cases they are polygonal. Surface views of the upper and lower epidermis of the blade are shown in Plate 3, figs. 28 and 29. The walls of the cells are less wavy than are the walls of the lower epidermis. Epidermal cells near the base of the glandular hairs are more or less elongated.

Structure of the stem.—A cross section from the tip or the very young region reveals that the stem is elliptical or sometimes circular in outline with a wavy margin and with numerous hairs. The glandular hairs, those containing or secreting oil and those not containing oil, are abundant, particularly in the regions between the ridges, as demonstrated in Plate 3, figs. 30 and 31, drawn from the surface section made from the young and the old stems. The characteristic wavy outline of the cross section of the stem is due simply to the subepidermal bundles of collenchyma, which project as ribs. Between these collenchyma regions are palisade chlorenchyma, which consist of two layers of short cells filled with chloroplastids (Plate 3, fig. 32). In somewhat older parts of the stem cells of this type are also found, but in the section of a very old stem they are absent. The same is true of the glandular hairs.

The most peculiar characteristic of the structure of this plant is the anomalous development of the stem. The original cambium, which has been formed in the usual manner, soon ceases to function and a new cambium ring or arc of meristem arises from the pericycle and produces secondary bundles with accompanying medullary rays, as well as conjunctive tissue of varying structure. The xylem portion of these secondary vascular bundles develops on the inner, and the bast portions on the outer side of the meristem. After a certain period of development the process is repeated, and as a result of this repetition more or less concentric rings of wood and bast are formed. As indicated by Solereder(13) this anomalous structure of the axis is a common characteristic of the other members of the Chenopodiaceæ, and occurs in the Nyctaginaceæ and Amaranthaceæ. Hérail(3) states, however, that this anomaly is not constant in the Chenopodiaceæ, for in his critical study on *Camphorosma monspeliaca,* he found that the structure of the plant is perfectly normal. According to Strasburger,(14) besides the three families mentioned, the Cycadaceæ, certain species of *Gnetum,* and the Phytolaccaceæ also exhibit extraordinary deviation in the development of secondary tissues.

The pericycle in the early stage of the stem, especially before the formation of the protoxylem or the primary vascular bundles, is not distinct. The cells of the stele have practically a homogenous characteristic, as shown in Plate 4, fig. 33, and some of them are filled with sand crystals of calcium oxalate. Soon the pericycle, which has the homogenous characteristic, becomes distinct, and groups of smaller cells appear interior to it, as illustrated in Plate 4, fig. 34. These groups of cells, which are rather long in the longitudinal section, give rise to vascular bundles. They have thin walls and divide actively. Those toward the center of the axis differentiate into protoxylem, and those toward the periphery into phloëm. The development of the protoxylem is evident in Plate 4, figs. 34 and 35. The cambium usually appears immediately after the protoxylem and phloëm regions have been established, and this cambium, formed between these two regions, is called fascicular cambium, or primary cambium. Its function is to give rise, when it divides, to xylem vessels toward the inner side, and phloëm cells toward the outer side, but it soon ceases its activity. The cells of the pericycle differentiate into meristematic tissue and develop secondary bundles with the accompanying medullary rays, as well as conjunctive tissue of varying structure. This is clearly shown in Plate 4, figs. 36 and 37, and Plate 5, fig. 38. After a certain period of development the secondary cambium ceases to develop or to give rise to wood toward the central axis and bast toward the periphery, and another cambium is formed from the pericycle, thus repeating the process. As a result of the various repetitions of the process concentric rings, or arcs, of wood and bast are formed. Sometimes, however, the pericycle cells around the stele do not all differentiate at the same time into meristematic tissue, so that the division takes place in only one side of the stem; this is the reason why arcs of wood and bast are formed, and explains also the excentric position of the pith. Plate 5, fig. 39, drawn from a section of a rather old stem, shows the details of the wood and bast produced by the activities of the cambium derived from the pericycle; Plate 5, fig. 40, is a diagrammatic cross section from the stem of a plant that had grown in the garden of the University of the Philippines for about six months. It illustrates clearly the concentric rings and arcs of wood and bast, as well as the prosenchymatous conjunctive tissue. The woody part consists mostly of pitted vessels and wood fibers, and the prosenchymatous tissue of wood parenchyma. The sclerenchyma ring which is usually present in the pericycle of most dicotyledonous stems is not found in *Chenopodium ambrosioides* Linnæus, as the pericycle of this plant consists simply of thin-walled parenchyma cells, somewhat elongated, which are also pitted.

This extraordinary deviation from the usual type of secondary growth in stems is also distinctly observed in the root. In fact, the rings, or arcs, of wood and bast, with the accompanying medullary rays and prosenchymatous conjunctive tissue, are better developed and more distinct in the root than are those of the stem. Plate 5, fig. 41, is a diagrammatic cross section of the root of the same age as that of the stem shown in fig. 40.

SUMMARY AND CONCLUSIONS

1. Two distinct types of hair are found in *Chenopodium ambrosioides* Linnæus; namely, the saclike or bladderlike, and the scythe-shaped or sickle-shaped. Microchemical tests show that the saclike hairs contain oil, and the scythe-shaped do not (Plate 2, figs. 23*a* to 23*e* and 24*a* to 24*f*).

2. Both types of hair, the scythe-shaped and the saclike, are found in (*a*) both surfaces of the leaf, but more abundantly in the lower surface; (*b*) in the crevices or depressions between the ridges of the younger part of the stem; (*c*) on the outer surface of the calyx when the fruit is young; and (*d*) on the upper half of the ovary or fruit. The hairs on the latter are saclike only and all contain oil (Plate 2, fig. 26, and Plate 3, fig. 32).

3. In the mature fruit, the oil glands are mostly collapsed and consequently very little oil is left (Plate 1, fig. 10).

4. Some oil is found in the embryo but none in the endosperm.

5. Microcrystals of calcium oxalate (sometimes occurring in rosette form) are abundant in the leaves, stems, and calyx, especially in the younger stage of these parts of the plant. Solution of oxalates is also detected by microchemical test (Plate 2, figs. 25 and 26).

6. The flowers are mostly bisexual, but some are unisexual. The unisexual flowers consist of females only (Plate 1, figs. 3 to 5).

7. The perianth consists of the calyx only, which is persistent, smooth when young, and verrucose when older. Sections of the calyx show that the cells of the ventral and dorsal epidermis are very irregular in outline and that stomata are present in the dorsal epidermis. The mesophyll cells toward the ventral side contain many microcrystals of calcium oxalate (Plate 1, figs. 5 and 7; Plate 2, figs. 19 and 25).

8. The pericarp is thin and hyaline. It surrounds and adheres to the seed. On the upper part it bears a large number of oil-containing hairs. It consists of from two to three layers of cells and the lower part, near the base, of three or more layers of cells. The outer and inner epidermal cells are both thin-walled cells with wavy outline (Plate 1, figs. 7, 11, 12*a*, and 13*a;* Plate 2, figs. 16, 17, and 18).

9. The seed is generally in a horizontal position in the fruit, and in a few cases erect or vertical. It is lentil-shaped, jet black and glistening when mature, and from 0.8 to 1 millimeter in diameter, and from 0.3 to 0.6 millimeter in thickness. A section of it shows that the embryo is coiled almost completely around the endosperm. The testa is composed of a layer of cells with thick walls that are heavily cutinized and are dark brown; the tegment consists of two or three layers of thin-walled, deep yellow cells. The endosperm consists of parenchyma cells filled with small spherical starch grains grouped in clusters (Plate 1, figs. 7, 12*b*, 13*b*, and 14; Plate 2, figs. 16, 17, and 20).

10. The leaf is bifacial and thin, with glandular hairs and stomata on both sides. The upper and lower epidermal cells are very irregular in outline. The palisade chlorenchyma on the upper and lower sides may consist of one or two layers of cells, and the spongy chlorenchyma occupies a small region only (Plate 2, fig. 26; Plate 3, figs. 27, 28, and 29).

11. The midrib is provided with collenchyma cells below the upper and lower parts of the epidermis, and there are some on the peripheral side of the vascular bundles, which take the place of the sclerenchymatous tissue. The vascular bundles vary from four to eight (Plate 3, fig. 27).

12. The primary vascular tissues are developed by the fascicular cambium formed in the usual manner, but the secondary wood and bast are formed by the activity of the cells of the pericycle. This extraordinary deviation from the usual type of secondary growth in the stem is also observed in the root (Plate 3, figs. 30 to 32; Plate 4, figs. 33 to 37; Plate 5, figs. 38 to 41).

13. It is evident from the results of this investigation that the oil of chenopodium is confined largely to the glandular hairs of saclike shape, and that some is found in the embryo. The glandular hairs are especially abundant on both sides of the leaves, on the upper half of the ovary when this is nearly mature, in the crevices or depressions between the ridges of the young portion of the stem, and on the surface of the calyx. In order to get a greater yield of oil, therefore, the entire plant, except the old part of the stem, and before the fruits and leaves become too mature, should be used in distillation. The most favorable time to collect the plant is after most of the flowers are open.

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ILLUSTRATIONS

[All drawings by the author except figs. 1, 12*a*, 12*b*, 13*a*, and 13*b* of Plate 1, which were drawn by Macario Ligaya, of the Bureau of Science.]

PLATE 1. CHENOPODIUM AMBROSIOIDES LINNÆUS

FIG. 1. *a*, a habit sketch of a portion of the plant; *b*, a leaf taken from the lower part of the plant.

2. A cluster of flowers.

3. An unopened unisexual flower.

4. An unopened bisexual flower.

5. An open bisexual flower, showing the partially united calyx, ovary, glandular hairs, stigma, and stamens.

6. A fruit showing the verrucose characteristic of the calyx and some hairs not containing oil.

7. A diagrammatic longitudinal section of an unopened flower, showing transverse view of the seed; *r*, radicle; *co*, cotyledon; *en*, endosperm; *go*, glandular hairs containing oil; *p*, pericarp; *f*, filament; *ca*, regions occupied by microcrystals of calcium oxalate; *tr*, tracheæ.

8. A young ovary taken from an unopened flower, showing the young and the old glandular hairs containing oil, *go*, and the character of the stigma, *st*.

9. An ovary taken from an open flower, with numerous glandular hairs containing oil, *go*.

10. A young fruit with numerous shrunken or collapsed glandular hairs, *go*.

11. Oblique view from top of fruit, with the calyx removed, to show the distribution of glandular hairs.

12*a*. Top view of a fruit, with the calyx removed, showing the position of the glandular hairs.

12*b*. A view of the seed shown in fig. 12*a*, with the pericarp removed.

13*a*. Lateral view of a fruit, with the calyx removed, showing the glandular hairs and the position of the micropyle.

13*b*. Lateral view of the seed shown in fig. 13*a*, with the pericarp removed.

14. A semidiagrammatic longitudinal section of a seed showing position of embryo; *co*, cotyledon; *pl*, plumule; *r*, radicle; *en*, endosperm; *sc*, seed coats; *m*, micropyle.

PLATE 2. CHENOPODIUM AMBROSIOIDES LINNÆUS

FIG. 15. A semidiagrammatic drawing of a transverse section of a seed, showing: *sc*, seed coats; *en*, endosperm; *r*, radicle; *co*, cotyledon.

16. A portion of a transverse section of a young fruit showing: *go*, glandular hair; *p*, pericarp; *sc*, seed coats; *en*, endosperm.

FIG. 17. A portion of a transverse section of a mature fruit, showing: *go*, glandular hair; *p*, pericarp; *t*, testa; *tg*, tegment; *en*, endosperm cells filled with starch grains, *sg*.

18. Surface view of a portion of the pericarp, showing the wavy character of the cells and a glandular hair containing oil, *go*.

19. A longitudinal section of a calyx: *go*, glandular hair; *tr*, spiral tracheids; *ca*, microcrystals of calcium oxalate; *pal*, palisade chlorenchyma.

20. A portion of a surface view of the seed coat.

21. Surface view of the inner epidermis of the calyx.

22. Outer epidermis of the calyx.

23*a* to 23*e*. Different stages of glandular hairs not containing oil.

24*a* to 24*f*. Different stages of glandular hairs containing oil.

25. Two cells from the mesophyll of the calyx containing microcrystals of calcium oxalate.

26. A thin cross section of a leaf: *go*, glandular hair containing oil; *ca*, calcium oxalate in rosette form.

PLATE 3. CHENOPODIUM AMBROSIOIDES LINNÆUS

FIG. 27. Transverse section of the midrib, showing: *col*, collenchyma; *vb*, vascular bundle; *chl*, chlorophyllous tissue; *go*, glandular hair containing oil; *go'*, glandular hair not containing oil.

28. A surface view of the upper epidermis of a leaf with a glandular hair containing oil.

29. A surface view of the lower epidermis of a leaf.

30. A surface view of an epidermis taken from the depression between the ridges of the young stem, showing glandular hairs containing oil and some not containing oil.

31. Surface view of the epidermis taken between the ridges of the old stem.

32. A diagrammatic cross section of a young stem, showing the distribution of: *go*, glandular hair containing oil; *go'*, glandular hair not containing oil; *pal*, palisade chlorenchyma; *col*, collenchyma region; *per*, pericycle; *vb*, vascular bundle.

PLATE 4. CHENOPODIUM AMBROSIOIDES LINNÆUS

FIG. 33. A portion of a transverse section of a very young stem, showing the very young glandular hair and the undifferentiated tissue and sand crystals of calcium oxalate.

34. A portion of a cross section of an older stem, showing the differentiation of the cells within the pericycle into protoxylem, phloëm, and fascicular cambium.

35. A young vascular bundle from a transverse section of the stem, showing the protoxylem, x_1; fascicular cambium, *fc;* and phloëm, *ph*.

36. A single vascular bundle from a cross section of an older stem, showing the primary xylem, x_1; fascicular cambium, *fc;* phloëm, *ph;* and the pericycle differentiating into meristematic tissue.

37. A portion of a transverse section of an old stem, showing the primary xylem, x_1; and the secondary xylem, x_2, formed by the meristematic tissue of the pericycle.

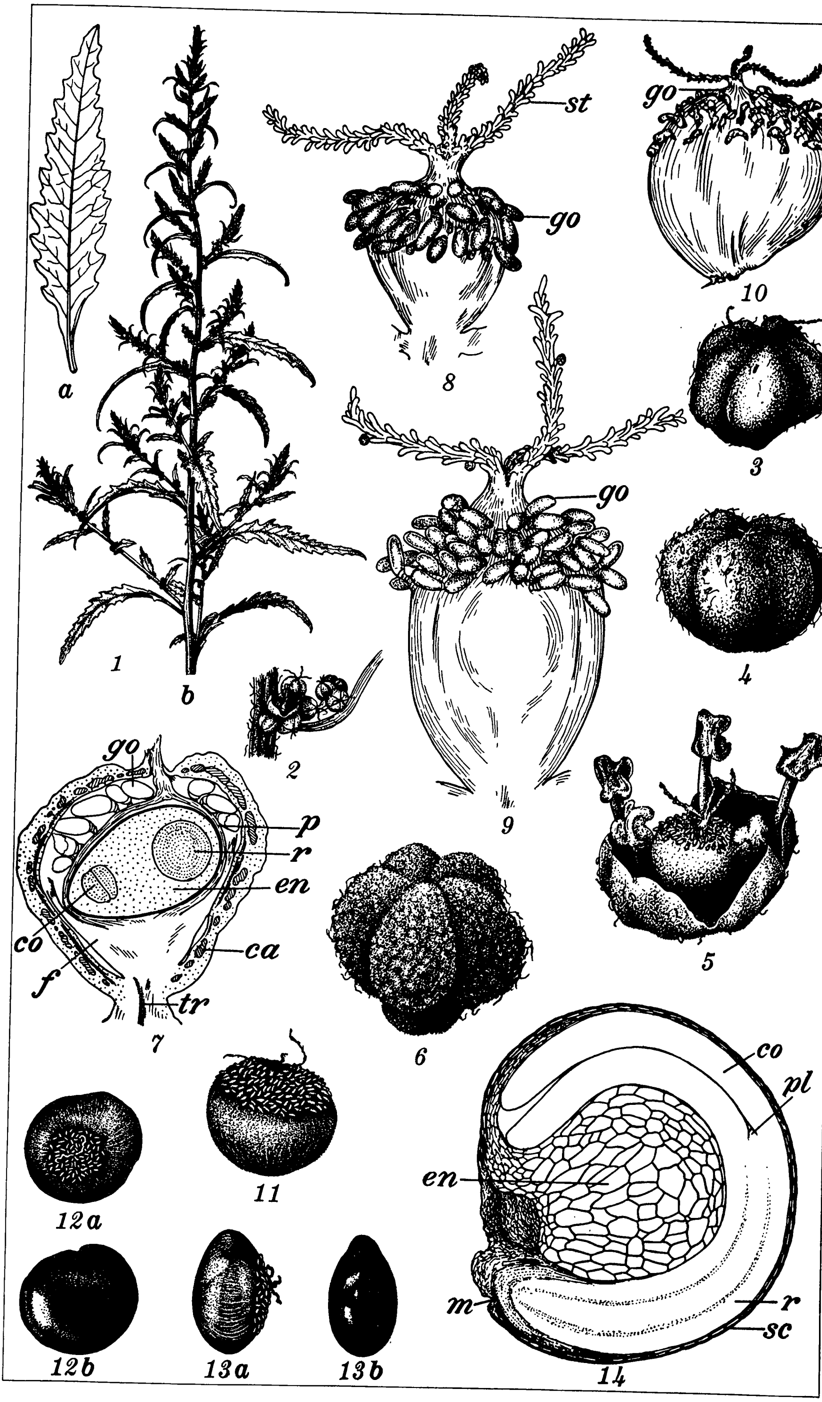
PLATE 5. CHENOPODIUM AMBROSIOIDES LINNÆUS

FIG. 38. A section from an older stem, showing the development of secondary wood.

39. A small portion of a transverse section of a very old stem, showing the rings or arcs of wood alternating with the bast formed by the activities of the pericycle cells.

40. A diagrammatic cross section of the stem showing the rings or arcs of wood and bast developed from the meristematic tissue of the pericycle: *w*, wood; *b*, bast; *cor*, cortex; x_1, primary xylem.

41. A diagrammatic cross section of an old primary root, showing the rings or arcs of wood and bast formed by the activities of the pericycle: *cor*, cortex; *w*, wood; *b*, bast; x_1, primary xylem.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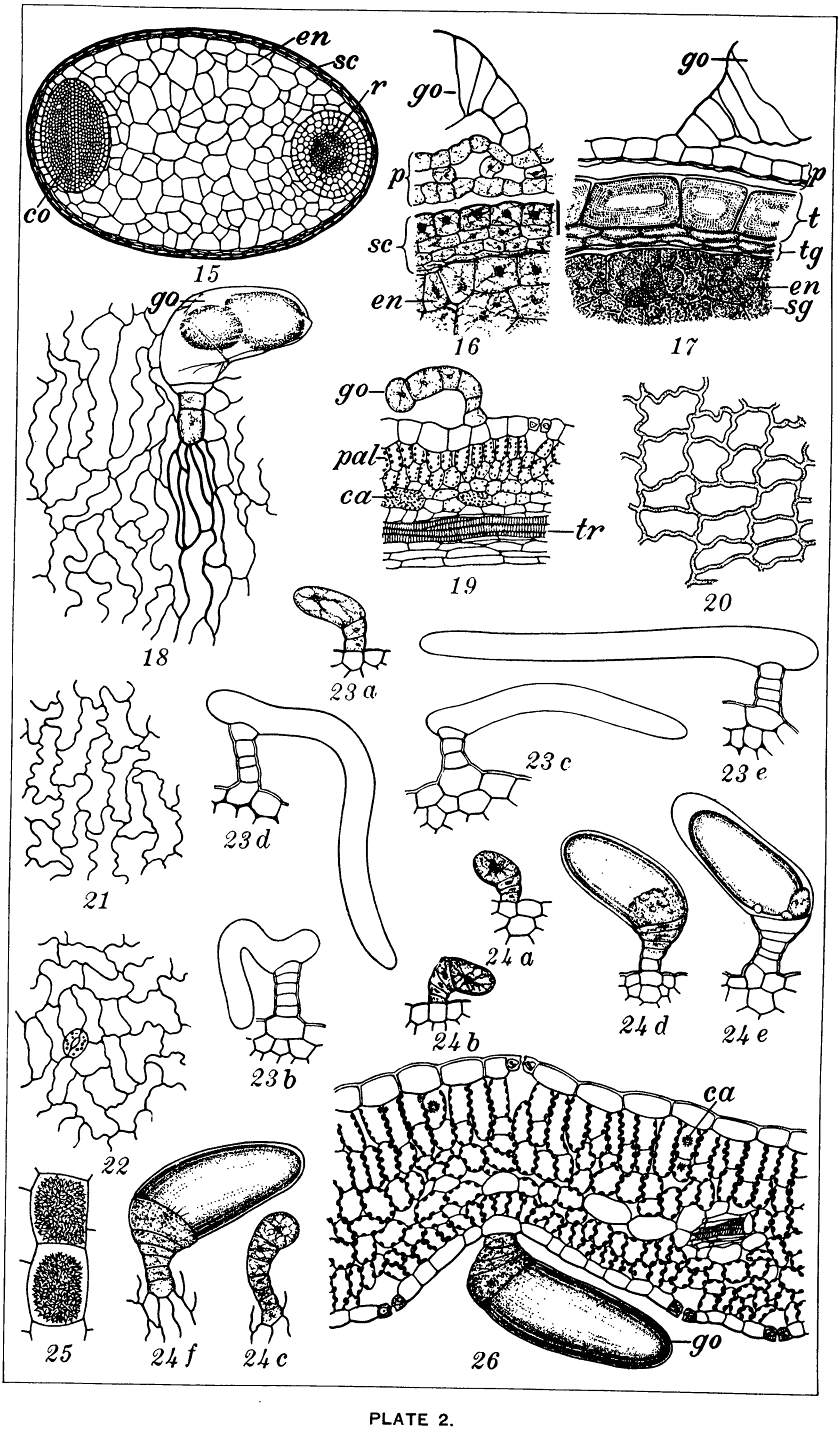
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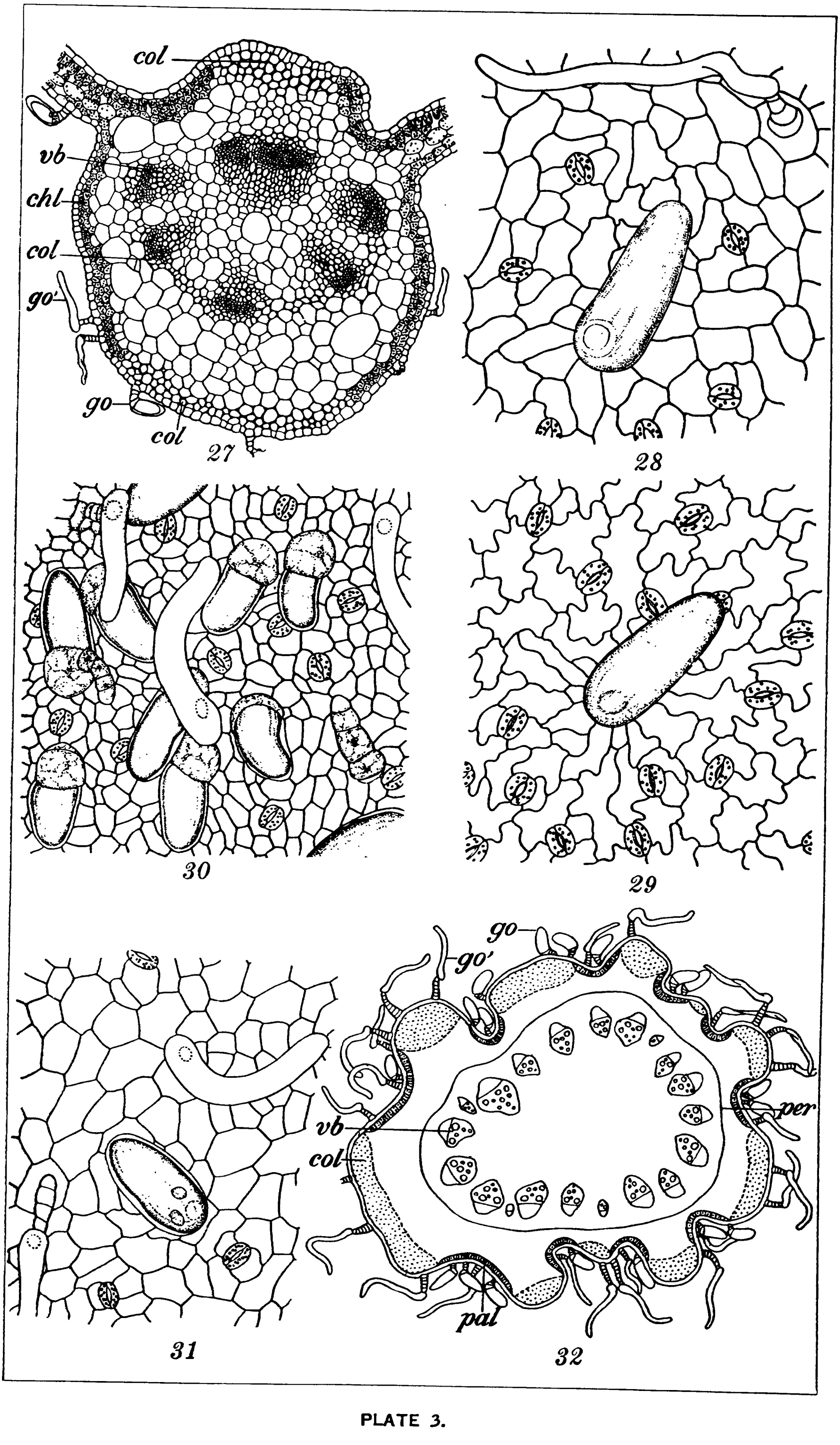
PLATE 2.



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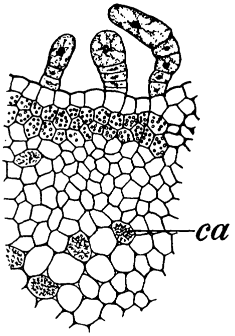

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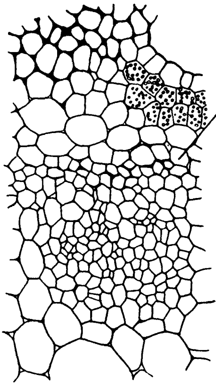

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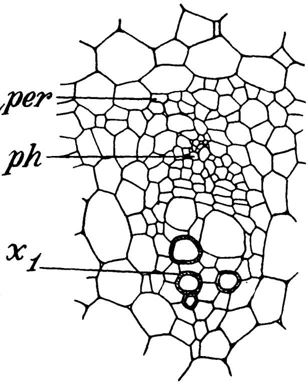

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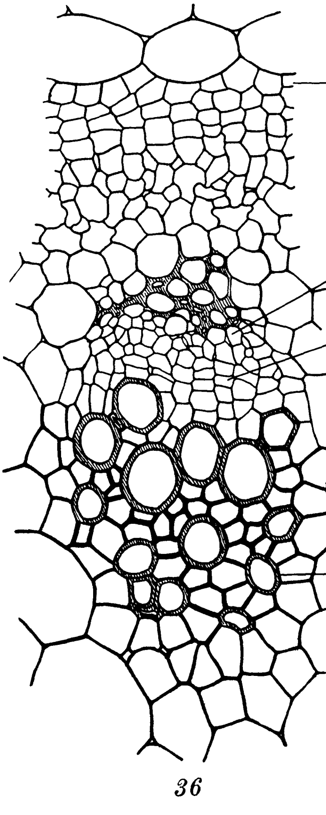

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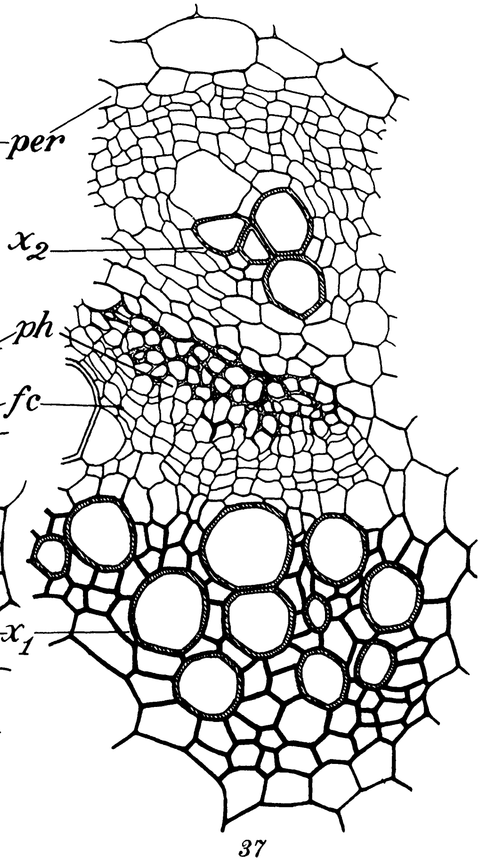

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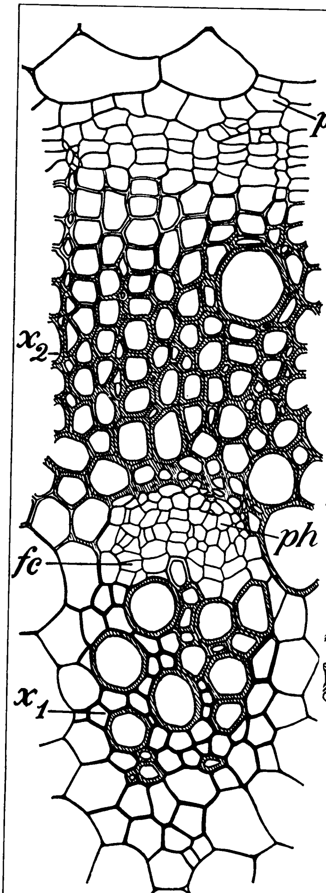

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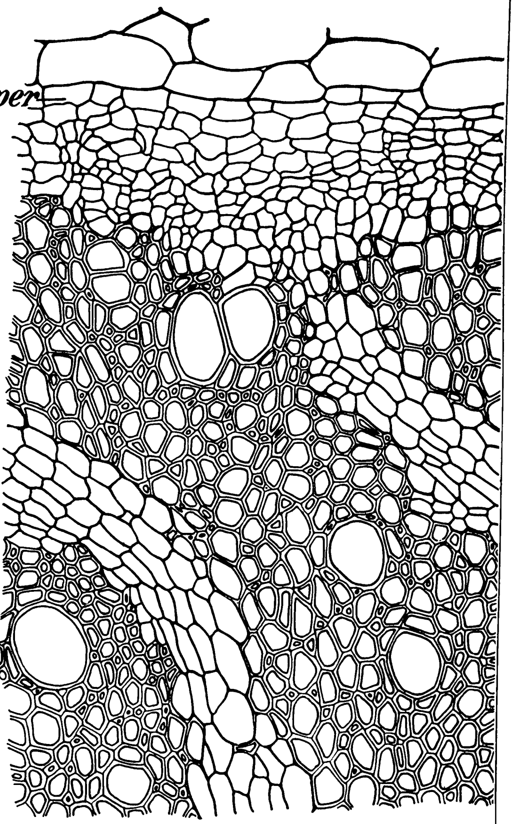

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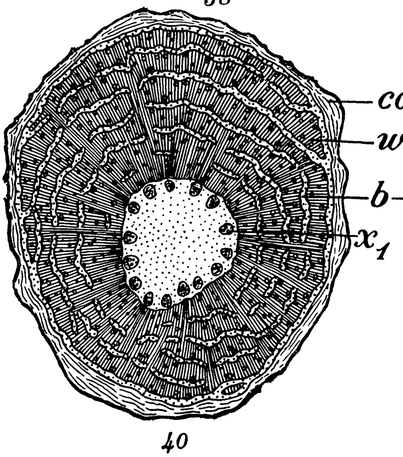

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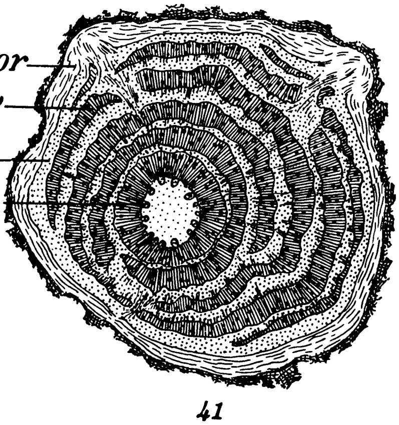

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PLATE 5.

STRUCTURAL CHARACTERISTICS OF DOUBLE-YOLKED EGGS AND THE RELATION OF THE MEMBRANES OF TWIN EMBRYOS RESULTING FROM A DOUBLE-YOLKED EGG

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ONE PLATE AND TWO TEXT FIGURES

The types of abnormal eggs produced by domestic fowls are: dwarf eggs, double- and triple-yolked eggs, and inclosed eggs (ovum in ovo). Although the double-yolked eggs are commoner than the other types, their occurrence is rare enough to warrant the report of additional data. The only report on an abnormal egg of this type in the Philippines, so far as I know, is that by Fronda.(4) The primary object of the following account is to describe four such eggs that have come under my direct observation during the last four years, and to report some observations on the disposition of the twin embryos and their membranes developing from a double-yolked egg. The features presented by the specimens here described, though some of them resembled those of the double-yolked eggs previously reported, will be of interest to naturalists as well as to those who are interested in raising poultry.

Our knowledge of the origin and production of double-yolked eggs is very incomplete; the various accounts on the subject appear to be not only contradictory but more or less speculative. Evidently the reason for this is that there is no way whereby the sequence of stages that an ovum undergoes, during the process of development within the bird's body, can be observed and timed. Parker(7) advanced the hypothesis that double-yolked eggs are due to the "simultaneous or almost simultaneous" liberation of two ova either from one or from two separate follicles; the ova proceed through the oviduct together, where they are both incorporated in a common set of egg membranes in an essentially normal manner. Glasser,(5) on the other hand, is of the opinion that there is no need of simultaneous discharge of two ova for the production of a double-yolked egg, in as much as the first ovum discharged may be delayed in the infundibulum until it is overtaken by another ovum resulting from the next ovulation. His findings, in the study of an abnormal ovary of a hen that habitually laid double-yolked eggs, led him to formulate the conclusion that, in this particular case at least, they were the result of the rupture of compound follicles resulting from secondary fusion. This conclusion was based upon the fact that, according to his observations, secondary fusion of follicles resulted in the establishment of a common blood supply for both ova, which, being in the same state of permeability, underwent equivalent growth and became liberated at the same time.

Curtis(2, 3) in his study of the relation of the egg envelopes, made on 131 double-yolked eggs, found only 21, or 16.03 per cent, that showed evidence of simultaneous ovulation. He considered the double-yolked eggs inclosed in a complete set of common egg envelopes as cases giving good reason for suspecting simultaneous ovulation. The various kinds of evidence obtained in his studies led him to conclude that simultaneous ovulation can hardly account for the production of double-yolked eggs; that the conditions necessary for their formation are that the two yolks furnished by two consecutive ovulations unite in the oviduct and then pass down the duct together, their union occurring "indiscriminately at all levels of the oviduct." As possible causes for the presence of two yolks in the duct at the same time, he suggests the following:

> That double-yolked eggs sometimes represent a heightened rate of fecundity;
>
> That the first egg may sometimes come to a place in the oviduct which is subnormally sensitive to peristaltic stimuli, and remain there until joined by the second yolk;
>
> That the second yolk may pass through the duct at an abnormally rapid rate;
>
> That antiperistaltic movements may carry the first egg back up the duct until it meets the second;
>
> That either the first or the second yolk to enter the duct was ovulated into the body cavity and was taken up by the duct shortly before or immediately after the next ovulation.

DESCRIPTION OF THE EGGS

Egg 1 used in this study came from the department of animal husbandry, College of Agriculture. It was one of two dozen hen's eggs requisitioned some time in the first semester of the school year (1921–1922) for the class in embryology. While I was putting the eggs in the incubator the unusual shape and length of this egg attracted my attention. The egg was found to be 62 millimeters long and 41 broad, and to weigh 66.4 grams.

The poles were almost equally blunt, the point being hardly distinguishable from the butt. The shell was brownish and perfectly smooth except at a point equidistant from the poles, where there was a rather rough, granular, and somewhat depressed band about 7 millimeters in width encircling the egg. The band was indicated internally by a low rounded ridge. The egg was left in the incubator overnight. When the egg was opened next morning the anomalous internal condition, consisting of the presence of two distinct yolks inclosed in a common shell membrane, was revealed.

The yolk lying toward the point was apparently normal in form and size. On its surface was a very conspicuous blastoderm with an apparently normal developing embryo at primitive-streak stage. The long axis of the embryo formed almost a right angle with that of the egg. The yolk nearer the butt was rather crescentic in form, having its convex surface directed toward the air chamber and its concave surface loosely applied to the other yolk. Its color was somewhat paler than that of the other yolk, and it showed no developing embryo. Its germinal disk was very indistinct.

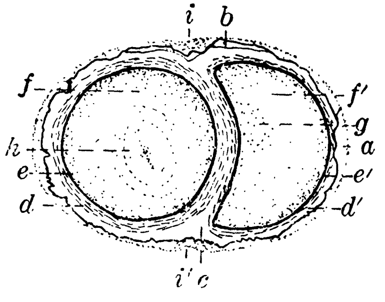

FIG. 1. Schematic drawing of double-yolked egg 1, showing the relation of its various parts. *a*, shell; *b*, shell membrane; *c*, albumen; *d*, *d′*, chalazal membranes; *e*, *e′*, vitelline membranes; *f*, *f′*, yolks; *g*, germinal disk; *h*, blastoderm; and *i*, *i′*, depression around the external surface of the shell.

The shell membrane presented no special features. The albumen was not only thick but also rather viscid in consistency. There appeared to be more than is usual for a single normal egg. In order to determine the character and arrangement of the other egg membranes, the contents of the egg were carefully poured into a beaker containing 20 per cent formalin. After shaking the beaker a little it was noted that the two yolks separated very easily, and that each yolk possessed distinct and independent chalazal and vitelline membranes. However, the chalazal membrane of the yolk nearer the butt was thinner than that of the other. There was no evidence of the presence of chalaza extending to the broad end of the egg. A drawing of the egg showing the relation of its various structures is shown in fig. 1.

Egg 1 somewhat resembled one of the eggs reported by Parker.(7) It was a very good example of Type II of Curtis's classification(3) (double-yolked eggs having separate chaliziferous layers but all or part of the thick albumen common to two yolks). The difference in thickness of the chalazal membranes of the two component yolks and the presence of a circular depression on the external surface of the shell make the explanation of the possible point of their union difficult. Probably the yolks came together in the infundibulum where most of the chalazal membrane is secreted, and their union occurred after the first yolk had been there long enough to acquire the thick chalazal membrane. On arrival of the second yolk in its vicinity active peristalsis set in, which drove the two yolks together down the oviduct. Thus, the second yolk could not stay in the funnel long enough to be surrounded by a chalazal membrane as thick as that of the first. This may account also for its being infertile. Another possibility is that the second yolk may have traversed the funnel at an abnormally rapid rate, so that a very thin chalazal membrane was formed before it joined the first yolk in the albumen-secreting portion. Curtis(2) is of the opinion that the ova of double-yolked eggs, having a depression around the center of the external surface of the shell, join while passing into the isthmus. In Egg 1 the crescentic form of the yolk nearer the butt may have been due to the pressure the thick albumen exerted upon it; its chalazal membrane, being thinner and weaker than that of the other yolk, must have been pressed tightly against it.

Egg 2 was one of eight hen's eggs bought for domestic use in June, 1923, from an unknown egg dealer at the market in Los Baños, Laguna Province, Luzon. Its unusually large size led me to suspect that it was a case of either double- or triple-yolked egg. So it was taken to the laboratory for a thorough examination.

The shell was white and perfectly smooth throughout. As to shape it showed nothing unusual, the point, as in normal eggs, being markedly distinguishable from the butt. It was 58 millimeters long and 44 broad, and weighed 64.5 grams. When the egg was opened the presence of two yolks, inclosed in a normal shell membrane and a common mass of albumen, was disclosed. One yolk was located toward the point, and the other toward the butt. They both appeared perfectly normal in form and color, and were apparently of the same size and age. Each yolk appeared to be normal for a single normal egg and showed a very distinct germinal disk. At their points of contact they were slightly flattened. The albumen was rather thick; otherwise it was perfectly normal for a single egg. When the contents of the egg were placed in 20 per cent formalin, it was noted that the yolks would not separate until the chalazal membrane was torn off. The removal of the latter proved that the yolks possessed distinct and separate vitelline membranes. The relations of the egg's various parts are shown in fig. 2.

Egg 3 was one of five duck's eggs bought in the Los Baños market on October 16, 1924, as embryological material. This egg was very much larger than the other four; it measured 74 millimeters in length and 50 in breadth. Its weight was 105.7 grams. The mean dimensions of the other four eggs were: length, 59.5 millimeters, and breadth, 44.5; the mean weight was 67.1 grams. The shape of egg 3 was normal, and the shell was white and uniformly smooth throughout. About 30 millimeters from the broad end, or butt, there was a very shallow transverse depression about 8 millimeters in width extending over one-fifth of the entire circumference of the egg. The shell seemed to be unusually thin, and in the vicinity of its narrow end, or point, it was almost transparent, so that the outline of a yolk within could be traced.

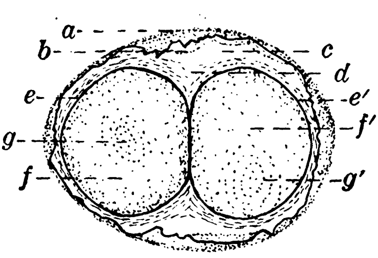

FIG. 2. Schematic drawing of double-yolked egg 2, showing the relation of its various structures. *a*, shell; *b*, shell membrane; *c*, albumen; *d*, chalazal membrane; *e*, *e′*, vitelline membranes; *f*, *f′*, yolks; and *g*, *g′*, germinal disks.

When the egg was opened, it was observed that the arrangement of its contents was practically identical to that noted in egg 2. There were two distinct yolks inclosed in a common shell membrane, chalazal membrane, and a thick layer of albumen. Their points of contact were not so flattened as in egg 2, but the two vitelline membranes adhered so closely at their points of contact that the two yolks did not separate when placed in 20 per cent formalin. Each yolk showed a very distinct and apparently normal germinal disk. The yolk lying nearer the point was found to be firmly attached to the shell membrane by a short but rather thick chalaza. The chalaza extending from the yolk lying nearer the butt was deflected toward one side instead of pointing toward the air chamber.

Eggs 2 and 3 undoubtedly fall under Type II of Curtis's classification(3) (double-yolked eggs having the entire set of egg envelopes common to two yolks). The arrangement of the parts of each egg very clearly showed that the two yolks had traversed the entire length of the oviduct together. The question as to whether eggs of this type are due to simultaneous ovulation or to the union of the two ova in the infundibulum, where they become incorporated in a common chalazal membrane before they pass down the rest of the oviduct, needs further evidence and elucidation before it can be answered. Curtis(3) states that eggs of this type give the best evidence of simultaneous ovulation, but unfortunately the various kinds of evidence he obtained in his observations led him to doubt the occurrence of such phenomena. He is inclined to conclude that the origin of double-yolked eggs having the entire set of egg envelopes common to two yolks is due to a heightened rate of fecundity in which there is an abnormally short interval between two consecutive ovulations.

Egg 4 was also a duck's egg bought for domestic use from an unknown person from the barrio of Mayondon, Los Baños, on November 13, 1924. Except for its very large size, externally, it presented nothing unusual, the point and butt being sufficiently distinguishable, and the shell shiny and smooth throughout. The color was almost white. It was 74 millimeters long and 53 broad, and weighed 99.8 grams.

Under the supposition that this was an egg with more than one yolk, it was incubated under the care of Doctor Fronda, poultry division, College of Agriculture, for eighteen days (November 14 to December 2, 1924) for the purpose of getting some information as to the relative position of the developing embryos within a common shell and the nature and arrangement of their embryonic membranes. The ordinary laboratory method of opening eggs was followed; namely, an elliptical piece of the shell was removed, great care having been taken not to rupture the underlying shell membrane. When the exposed shell membrane was cut and deflected toward one side, the presence of two duck embryos covered with black feathers and inclosed in a common shell membrane was revealed. Both were living and appeared to be in the same stage of development. They were lying side by side in reverse positions, the right side of the embryo nearer the butt directed toward the air chamber, and that of the other embryo toward the point. Their long axes were apparently parallel, but they were oblique to the major axis of the whole egg. In all probability this relation of the embryonic axes and the long axis of the egg was the result of the embryos beginning to accommodate themselves to the form of the egg so as to lie parallel to its long axis. According to Lillie(6) and Bartelmez(1) in the majority of the cases, if an egg be placed with the blunt end to the left, the head of the embryo will be found directed away from the observer when the blastoderm is above. In egg 4 this assertion finds support only in the embryo lying nearer the narrow end, or point, of the egg.

The embryos were slightly different in size, and their weights were as follows:

	Grams.
Embryo lying nearer the point:	
With the yolk sac	35.5
Without the yolk sac	15.0
Embryo lying nearer the butt:	
With the yolk sac	41.0
Without the yolk sac	20.0

In spite of this difference in size both appeared normal in development for normal duck embryos of eighteen days' incubation. They were surrounded by a common chorion and a common allantoic cavity, but were provided with separate amnion and yolk sac. The possession by each embryo of an independent and apparently normal allantoic stalk and the very apparent anastomosis of the blood vessels of the outer walls of the allantois indicate conclusively that the embryos did develop separate chorion and allantois which later fused about the region of the equator. In most part the inner wall of the allantois was already inseparable from the corresponding amnion. Stretched between the two embryos was a very vascular membrane formed by the union of the apposed parts of the inner wall of the allantois. The membrane had no attachment to the shell membrane, and was very much folded in the neighborhood of the lower pole of the yolk sacs. Together with the chorion, it almost completely surrounded a very viscid mass of albumen that had accumulated around the two yolk-sac umbilici. The latter were in direct apposition, but not fused together.

From the data furnished by the embryos and their membranes, it can be safely concluded that it was a case of a double-yolked egg, the two separate ova both being fertilized. The question, under which type of Curtis's classification(3) should this egg fall, cannot be answered here, for the embryos had already reached such a degree of development that study of the relation of the yolks to the albumen and chalazal membrane was impossible. The photographs of the twin duck embryos, with parts of their accessory appendages, are shown in Plate 1.

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ILLUSTRATIONS

PLATE 1

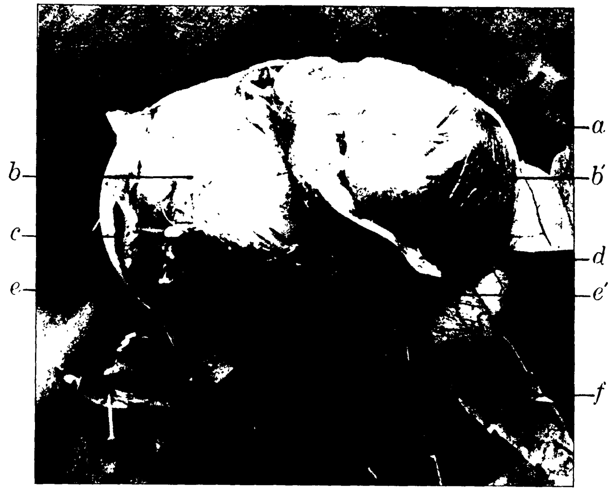
FIG. 1. Showing the relation of the twin embryos in situ. *a*, shell; *b,b'*, yolk-sacs; *c*, air-chamber; *d*, amnion; *e,e'*, embryos; *f*, shell membrane with the attached chorion and outer wall of the allantois.

2. Showing the two distinct duct embryos together with parts of their accessory appendages. *a*, hardened albumen (due to formalin) found surrounding the yolk-sac umbilici; *b*, yolk-sac umbilicus; *c*, internal surface of the shell showing the anastomoses of the blood vessels in the outer wall of the allantois.

TEXT FIGURES

FIG. 1. Schematic drawing of double-yolked egg 1, showing the relation of its various parts. *a*, shell; *b*, shell membrane; *c*, albumen; *d,d'*, chalazal membranes; *e,e'*, vitelline membranes; *f,f'*, yolks; *g*, germinal disk; *h*, blastoderm; and *i,i'*, depression around the external surface of the shell.

2. Schematic drawing of double-yolked egg 2, showing the relation of its various structures. *a*, shell; *b*, shell membrane; *c*, albumen; *d*, chalazal membrane; *e,e'*, vitelline membranes; *f,f'*, yolks; and *g,g'*, germinal disks.



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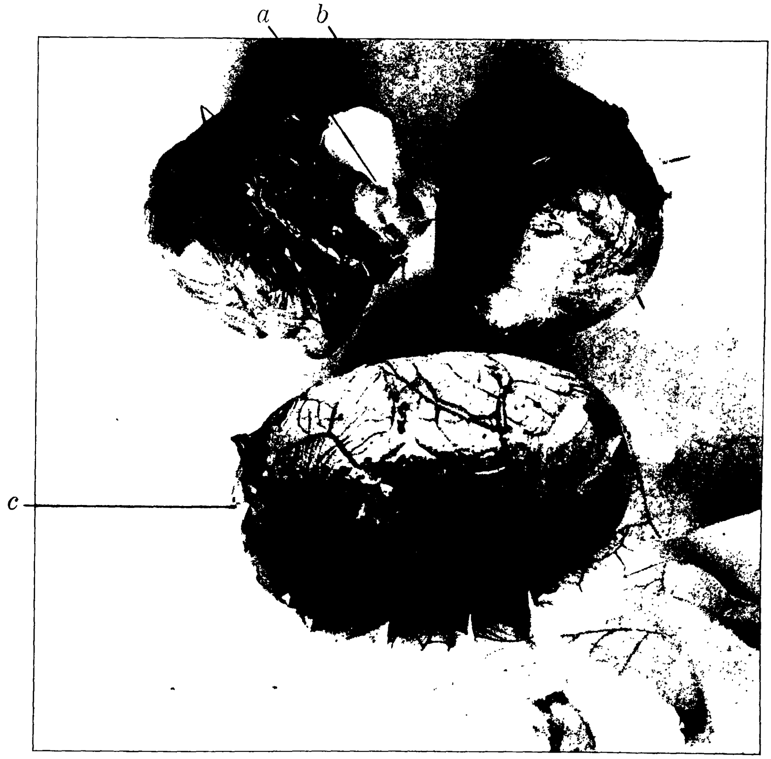

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PLATE 1. CONTENTS OF A DOUBLE-YOLKED EGG.

TWO NEW SPECIES OF DRAGON FLIES (ODONATA) FROM THE PHILIPPINE ISLANDS, WITH REMARKS ON THE GENUS HELIOGOMPHUS

By F. F. LAIDLAW

Corresponding Member of the Malayan Branch, Royal Asiatic Society

THREE TEXT FIGURES

ANISOPTERA

GOMPHIDÆ

Genus **HELIOGOMPHUS** Laidlaw

Genotype *H. nietneri* (de Selys).

A gomphine genus with the following characters:

1. Triangles, supratriangles, and subtriangles uncrossed.
2. Triangles regular in shape (that is, sides definitely rectilinear).
3. Triangles of forewing rather shorter than those of hind wing.
4. No trigonal supplement.
5. No well-developed supplementary sector to Rs or to M_4.
6. Cross veins between M_{1+3} and M_4 show no indication of being spaced out.
7. Pterostigma feebly braced or not at all.
8. No basal postcostal nerve.
9. No "anal loop" on hind wing.
10. Sectors of arculus at first converging, then diverging.
11. Cells between Cu_2 and anal margin not arranged pectinately.
12. Cu_1 reaches margin of forewing a little beyond level of nodus.
13. Segment 9 of abdomen shorter than segment 8.

Characters 1 to 7 especially indicate the position of *Heliogomphus* in a series of genera called by Williamson the series "Epigomphus," but it may be remarked that two Oriental genera, which I refer at present to this series, show a distinct tendency to a spacing out of the cross veins between M_{1+3} and M_4, and therefore differ from *Heliogomphus,* as from other genera of the series, in respect to character 6. As in other genera, the legs in *Heliogomphus* are relatively short, the hindmost femora when adpressed reaching to the apex of the first segment of the abdomen.

Heliogomphus is distinguished from other Oriental genera of the Epigomphus series by characters as follows:

Perissogomphus, 6, 9, 10, 11.
Macrogomphus, 8, 10, 11, 14.
Acrogomphus, 6, 7, 9, 11.
Leptogomphus, 8, 10.
Microgomphus, 12.

Certain secondary sexual characters also differentiate the males of *Heliogomphus* readily from those belonging to allied genera. Of these the most striking are the lyrate upper anal appendages, which as a rule have their apices white or yellow, contrasting with the black bases. These differ greatly in appearance from the chelate appendages of *Microgomphus*.

Equally important is the large size of the vesicle of the penis and the relatively small size of the hamuli, characters first pointed out by Ris. *Microgomphus* shows a similar condition, whilst in *Leptogomphus* the converse obtains.

It is evident that *Heliogomphus* and *Microgomphus* are closely allied, and the discovery of intermediate forms is possible. At present one can add size to the few characters that separate them. The known species of *Microgomphus* are distinctly smaller than any known *Heliogomphus* species. Their coloring also is more variegated. It is not unlikely that larval characters may help to differentiate the two.

The following are the described species referable to *Heliogomphus:*

Heliogomphus nietneri (de Selys), Ceylon and Assam.
Heliogomphus pruinans Fraser, South India.
Heliogomphus spirillum Fraser, Assam.
Heliogomphus retroflexus (Ris), Tonkin.
Heliogomphus scorpio (Ris), South China.
Heliogomphus kelantanensis (Laidlaw), Malay Peninsula.

To these I now add one new species.

Heliogomphus bakeri sp. nov. Text fig. 1.

LUZON, Laguna Province, Mount Maquiling (*C. F. Baker*), one male, autotype.

Length of abdomen, 38 millimeters + 1.25; of hind wing, 35.

Head, upper lip dull yellow, finely margined with black, and with a fine, median line of black bisecting it. Genæ and frons also yellow. Clypeus, vertex, and occiput black.

Prothorax black, its anterior lobe and a pair of spots on either side of the middle lobe yellow.

Synthorax, dorsum black, mesothoracic collar yellow, narrowly interrupted in the middle line; joined on either side by the anterior end of the dorsal bands, which form with the collar ∠\-shaped marks, and are pointed at their upper ends near the antealar sinus. To the outer side of each, and near the upper end lies a small triangular mark of yellow, the vestige of an antehumeral band. Sides yellow, with a black line along the position of each of the lateral sutures. Ventral surfaces yellow. Legs entirely black excepting the coxæ which are yellow.

Abdomen, segments 1, 2, 8, and 9 moderately inflated. Ground color black, smooth, rather shining. Brownish yellow marks on the sides of the first and second segments, auricles of the same color. Small basal lateral marks of orange on segments 3 to 6. Segment 7 with square orange mark on the dorsum, occupying its basal quarter. A small, basal, triangular mark of the same color on the dorsum of segment 8, and paired apical marks of a paler yellow on the sides of the same segment.

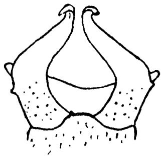

FIG. 1. *Heliogomphus bakeri* sp. nov.; male, anal appendages, dorsal view.

Anal appendages black, the upper ones shading to pale yellow apically. The upper appendages are lyrate, each with a very small extero-lateral projection at the point at which they begin to curve inward, and with their apices curved upward. Lower appendage with widely divaricated branches, about half the length of the upper.

Forewing with a single row of cells between Cu$_2$ and the anal margin of the wing (on the forewing two cells for the space of a single cell). Two cross nerves in the cubital space; 16 antenodal, 15 or 16 postnodal cross nerves.

Hind wing with at first 2, then 3 rows of cells between Cu$_2$ and the anal margin of the wing. One cross nerve in cubital space; 11 antenodal and 14 or 15 postnodal cross nerves.

Heliogomphus bakeri differs from *H. kelantanensis* (as I believe do all the other described species of the genus) in that M$_4$ and Cu$_1$ are not parallel as far as the level of the nodus in the front wing. It differs from all the remaining species except *scorpio* in that the dorsal stripes of the synthorax join the mesothoracic collar (as also in *kelantanensis*); *bakeri* further agrees with *scorpio* in having two cross nerves in the cubital space of the forewing, and in this respect these two species differ from the other species of the genus. Lastly, *scorpio* has two rows of cells between Cu$_2$ and the anal margin of the forewing, whilst the anal appendages of the male are much bolder in outline, and each of the upper appendages carries a very large knoblike extero-lateral process.

ZYGOPTERA

PLATYCNEMINÆ

Coeliccia dinoceras sp. nov. Text figs. 2, 3.

MINDANAO, Lanao Province, Kolambugan, May 18, 1914 (*E. A. Wileman*). In my collection. One male, autotype.

Length of hind wing, 25 millimeters, of abdomen 35 + 1.25 (anal appendages).

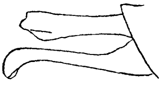

FIG. 2. *Coeliccia dinoceras* sp. nov.; male, anal appendages, lateral view.

Head, generally dull black, upper lip black, rather metallic. Genæ and anteclypeus blue, oval-oblong postocular spots of the same color, small and lying transversely. Basal joint of antennæ white; a transverse blue mark on either side of posterior ocelli. Dorsal surface of prothorax black, with a large, nearly circular spot on the middle lobe on either side of the middle line probably blue during life, but faded to a dirty yellow in the dried specimen. Posterior margin of prothorax armed with a pair of relatively large spines, one on either side. These project upward and are sharply curved forward toward their extremities. Ventrally the coloring of the prothorax fades to a dull yellow.

Synthorax, dorsum black, the black just passing the humeral suture laterally. A pair of blue (?) dorsal bands, narrow and tapering toward their upper extremities. To the outer side of each of these, and close to the antealar sinus is a minute triangular spot of the same color as the bands. Sides blue (?) with a narrow line of black along the second lateral suture. Legs yellow, with a narrow line of black along the posterior surface of the femora.

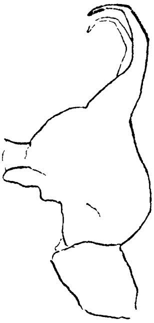

FIG. 3. *Coeliccia dinoceras* sp. nov.; male, prothorax, lateral view, showing prothoracic horns.

Abdomen long and very slender, segments 7, 8, and 9 progressively a little stouter than the others. Coloring generally a dull brownish yellow anteriorly, paler beneath, passing gradually to dull black on the hinder segments (6 to 10). The first segment is probably pale blue in life, with a narrow, longitudinal band of black mid-dorsally. The second segment and base of the third have paler markings at the sides which also are probably blue in the living insect. The appearance of the distal third of the eighth segment dorsally, and of the whole dorsum of 9 and 10 suggests that these, too, are blue.

Anal appendages black. Both pairs are long and slender, the lower pair decidedly longer than the upper pair, the latter rather club-shaped with bluntly pointed apices. Lower pair cylindrical, hooked downward a little at their apices.

Venation, wings petiolated to level of Ac. Pterostigma small, slightly inflated, black, covering one cell. M_3 rises from subnodal vein, Rs well distal to it. Quadrangle of forewing with costal margin about three-fifths length of anal margin; of hind wing about four-fifths. Three cells between distal end of quadrangle and subnodal cross vein; 16 or 17 postnodal cross nerves on forewing, 15 on hind wing.

This species, the first of the genus to be recorded from the Philippine Islands, is distinguished at once from other known species of the genus by the remarkable armature of the prothorax. It is the only species in which the male carries any such ornament. The anal appendages likewise are rather characteristic. Venationally the species comes near to a group of Bornean species (*C. macrostigma* Laidlaw, *C. campioni* Laidlaw, etc.). These are all remarkable for the specialization of the female prothorax, and it will be interesting to see whether the female specimen of *dinoceras* is characterized likewise.

In any case, the present species seems to me to have no near ally in the genus.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. *Heliogomphus bakeri* sp. nov.; male, anal appendages, dorsal view.
2. *Coeliccia dinoceras* sp. nov.; male, anal appendages, lateral view.
3. *Coeliccia dinoceras* sp. nov.; male, prothorax, lateral view, showing prothoracic horns. (Camera lucida, Zeiss.)

NEW AND RARE PHILIPPINE LEPIDOPTERA

By W. SCHULTZE

Entomologist, Bureau of Science, Manila

TWO PLATES AND ONE TEXT FIGURE

Some species of Lepidoptera known from other localities, which have also been discovered in the Philippines, are recorded in this paper, particularly because of their interesting geographic distribution; also, several new species are described.

PAPILIONIDÆ

Papilio xuthus Linnæus.

Papilio xuthus LINNÆUS, Syst. Nat. (1767) 751; PRYER, Rhop. Nihonica (1886) 3, pl. 1, figs. 2a, 2b; BINGHAM, Fauna Brit. India, Butterfl. 2 (1907) 38.

This species has a very wide range and extends to eastern China, Korea, Japan, Formosa, the Riu Kiu Islands, the Bonin Islands, and Guam. A rather distinct and localized race of this species is found in the higher-mountain regions of northern Luzon, in the Philippines, which to my mind should be designated as *Papilio xuthus* subsp. *benguetana* Joicey and Talbot. These authors described the Philippine form or race of *xuthus* as *Papilio benguetana*,[1] based on a single specimen. Five specimens before me show very little variation; they have characters intermediate between the Japanese summer form, or typical *xuthus* Linnæus, and the spring form, or var. *xuthulus* Bremer. My specimens were collected in May, 1909, in Luzon, Benguet Subprovince, Haight's Place (2,450 meters), by R. C. McGregor.

SATURNIIDÆ

Actias maenas Doubleday.

Actias maenas DOUBLEDAY, Ann. & Mag. Nat. Hist. 19 (1847) 95, pl. 7, fig. 1; HAMPSON, Fauna Brit. India, Moths 1 (1892) 14.

A single female specimen agrees perfectly with the original description, as well as with Doubleday's figure. A single male is in a bad state of preservation, the tails from near the base to the beginning of the apical expansion are sprinkled with very dark brown, on upper side and underside. Length of forewing, female, 78 millimeters; length of tail, from upper margin of eyespot on hind wing to apex, 111; length of tail, male, 128 millimeters.

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[1] Entomologist 56 (1923) 273.

LUZON, Benguet Subprovince, Baguio, 1,450 meters, June 14, 1912 (*Mrs. D. C. Worcester*); May 21, 1921 (*W. D. Smith*).

EUPTEROTIDÆ

Melanothrix nymphaliaria sanchezi subsp. nov. Plate 2, figs. 1 and 2.

Female.—Wings very pale creamy white with brownish black markings as follows: Forewing, basal area from costa to vein 2 with a subtriangular patch and along costa suffused brownish. An outer marginal band, broadest at costa, extending to hind margin; the inner edge of this band undulated and the outer edge interrupted by oblong tooth spots. Hind wing with a marginal band similar to the one on forewing. Underside of both wings identical with upper side. Head, antennæ, and collar brownish black, thorax dorsally white, ventrally suffused brownish, legs brown. Abdomen dorsally, except apical half of last segment, brownish black, but densely scattered with white scales so that the color appears grayish; hind margins of segments with a cilia of white scales forming indistinct narrow white bands. Underside of abdomen and apical half of last segment dorsally yellow ochraceous.

Male.—Wings and body dorsally uniformly dark reddish brown, costa and cilia along outer margin of a darker shade; underside of wings and body paler brown.

Length of forewing, male, 39 millimeters; female, 38 to 41.

LUZON, Benguet Subprovince, Baguio, Mount Mirador, 1,600 meters (*F. Sanchez* and *T. Hubbel*).

The five female specimens before me, all from the above locality, show almost no variation in the markings. Another local form of the above I designate as—

Melanothrix nymphaliaria sanchezi var. **baletana** var. nov. Plate 2, fig. 3.

Wings snow white, with brownish black markings similar as in subsp. *sanchezi* but occupying a larger area. The basal dark area of forewing extends between veins 2 and 4 to the marginal band, which is much broader than in *sanchezi*. In the hind wing the marginal band is also much broader. A further peculiarity is that the outer margin of the forewing is more rounded than in subsp. *sanchezi* and the typical form of *nymphaliaria* Walker. The abdomen is dorsally more blackish in this variation than in subsp. *sanchezi.*

Length of forewing, female, 38 millimeters.

LUZON, Nueva Vizcaya Province, near Balete Pass, about 1,000 meters altitude (*Schultze*).

It appears that both subsp. *sanchezi* and var. *baletana* represent intermediate forms leading to *M. nymphaliaria philippina* Rothschild,[2] the latter of which Semper[3] designated in the text as *M. pulchricolor* Felder, from Polillo, but in the explanation of his Plate 2, fig. 2, it is called *M. nymphaliaria* Walker, var. The Mindanao specimens of Semper's *M. pulchricolor* Felder were described by Rothschild[4] as *M. semperi;* the brief description mentions that the abdomen is yellow with black transverse bands. Still another Philippine species of this genus is *M. alternans* Pagenstecher from Palawan.

BOMBYCIDÆ

Gunda javanica palawana subsp. nov.

Female.—Very similar in general coloration to typical *G. javanica* Moore,[5] but differing as follows: Apex of forewing less pointed, more obtusely rounded than in the above. Costa near apex with an elongate brownish patch, the dark brown patch at apex and outer margin more prominent. Underside of forewing, outer marginal area dark brown, two distinct dark brown postmedial bands, basal area light grayish brown. Underside of hind wing with a blackish discocellular spot, a prominent dark brown medial band, and a narrower postmedial band, both of which extend from costal to inner margin. Length of forewing, female, 32 millimeters.

PALAWAN, Ulugan Bay, on ship's search light (*Schultze*).

Gunda sikkima Moore.

Gunda sikkima MOORE, Proc. Zool. Soc. London (1879) 406, pl. 33, fig. 3.

According to Hampson this species is identical with his *G. variegata*[6] and *G. thwaitesii* Moore. A male specimen of this species agrees very well with the indicated figure of *variegata*, except that the thorax and the abdomen are lighter in general color in the Philippine specimen.

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[2] Novit. Zool. 24 (1917) 464.

[3] Die Schmetterl. d. Philip. Inseln 2 (1896–1902) 387.

[4] Novit. Zool. 24 (1917) 465.

[5] Proc. Zool. Soc. London (1872) 576, pl. 33, fig. 6; Hampson, Fauna Brit. India, Moths 1 (1892) 36, fig. 20.

[6] Ill. Het. Brit. Mus. 9 (1893) 55, pl. 160, fig. 7.

Length of forewing, male, 18 millimeters.

MINDANAO, Agusan, Butuan, October, 1910 (*Schultze*).

SYNTOMIDÆ

Euchromia tawiensis sp. nov.

Wings in color and pattern similar to *E. elegantissima* Wallengrén, but the spots on the hind wing relatively larger than in the species mentioned. First abdominal segment above creamy white, second and third black with traces of light bluish scales and a white spot at sides. Fourth and fifth segments crimson, other segments black.

Length of forewing, male, 18 to 23 millimeters; female, 21.5.

BUNGAU, in the Tawitawi group, Sulu Province (*A. Duyag*).

My collector obtained three specimens of this interesting species, which is related to *E. polymena* Linnæus and *E. elegantissima* Wallengrén but is at once distinguished from the latter and other related species by the fourth and fifth abdominal segments only being crimson. *Euchromia elegantissima* ranges from Luzon to Mindanao but seems to be replaced in the Sulu group by *E. tawiensis*, and in Palawan, Dumaran (Bureau of Science collection, accession No. 17965, August 27, 1913, *Schultze*), Cuyo (accession No. 10857, April 10, 1909, *Schultze*), and Busuanga (accession No. 13989, September 17, 1910, *Schultze*) by *E. horsfieldi* Moore. The last-mentioned species demonstrates in a marked degree the ancient connection of the Palawan–Busuanga faunistic elements with Borneo, the northern limit of which seems to be Busuanga Island.

ZYGAENIDÆ

CHALCOSIINÆ

Ancistroceron luzonensis sp. nov. Plate 1, fig. 7.

Forewing iridescent dark violet blue, basally with some radiating ochraceous streaks. Hind wing bluish black, basally below the cell with an oblong hyaline area, the space between the latter and the inner margin also ochraceous. Head and thorax ochraceous, abdomen dorsally bluish black, first to fourth segments ventrally silvery whitish, laterally with a marginal band of the same color, the other segments with an indistinct marginal band ventrally.

Length of forewing, male, 15 millimeters.

LUZON, Benguet Subprovince, Baguio (*Schultze*), April, 1925.

The insects of this species feed on *Medinilla* sp., which is abundant around Baguio.

Cyclosia sordidus subsp. **bungauensis** subsp. nov. Plate 1, fig. 3.

Cyclosia sordidus WALKER, Journ. Linn. Soc. 6 (1862) 98.

Forewing greenish black with a postmedial pale creamish white oblique band consisting of elongate spots. Hind wing pale creamy white with an irregular blackish band at outer margin. Underside of fore and hind wings similar to upper side but with an additional series of small whitish submarginal spots. Antennæ, head, thorax, and abdomen greenish black, the latter ventrally white-banded.

Length of forewing, female, 27 millimeters.

BUNGAU, Tawitawi group (*A. Duyag*).

Milleria adalifoides sp. nov. Plate 1, fig. 4.

Wings creamy white. Forewing with all the veins brownly marked. Hind wing with some ill-defined and suffused brownish submarginal spots. Underside with the veins less strongly brownish streaked, both wings with an ill-defined submarginal brownish band consisting of oblong more or less confluent spots. Hind wing with the costal margin brownish and the inner marginal area below the cell up to the submarginal band yellow. Antennæ brownish, thorax and abdomen grayish white.

Length of forewing, female, 24.5 millimeters.

DUMARAN, near Palawan (*Schultze*), Bureau of Science collection (accession No. 17967).

This species is a true *Milleria*, and is slightly related to *M. adalefa* Doubleday.[7]

COSSIDÆ

Xyleutes plesseni sp. nov. Plate 1, fig. 5.

Wings pale flesh colored but the greater part of the area, particularly of the forewing, suffused with pale grayish marmorated blotches. Forewing with the pale flesh ground color forming an elongate patch on the costa at apex and an irregular area along the hind margin. Hind wing with the marginal areas flesh colored, also thorax and abdomen dorsally. Other parts of the body and legs grayish.

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[7] Ann. & Mag. Nat. Hist. 19 (1847) 76; Seitz, Gross-Schmetterl. d. Erde 10 (1907) 36, pl. 7, fig. a3.

Length of forewing, male, 30 millimeters.

LUZON, Manila, at light, February, 1911 (*G. v. Plessen*), Bureau of Science accession No. 14276.

I name this species in honor of its collector, Baron Gustav von Plessen ✠, who donated it to the Bureau of Science collection.

DREPANULIDÆ

Genus **SILVASPICA** novum

Palpi very long, first and second joints thickly scaled, second joint longest, slightly longer than third, the latter very slender. Proboscis present. Antennæ of male with the branches long in basal half, extremely short in apical half. Mid and hind tibiæ with one pair of spurs. Forewing with vein 4 from lower angle of cell, 6 from upper angle, veins 7 and 8 from end of areole. Hind wing with the margin very slightly produced at vein 4; veins 6 and 7 forked a short distance beyond the cell. Frenulum present.

Type species, *S. baletensis* sp. nov., from Luzon.

Silvaspica baletensis sp. nov. Plate 1, fig. 1; text fig. 1.

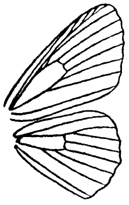

FIG. 1. *Silvaspica baletensis* g. et sp. nov., wing venation.

Wings light yellow. Forewing with a dark grayish blue marginal band along costa and outer margin, broadest at apex. Hind wing with a similar band along outer margin. Antenna and vertex of head also grayish blue, front of head, palpi, thorax, abdomen, and legs pale yellow. Fore legs with the femora and tibiæ streaked with grayish blue.

Length of forewing, males, 18.5 to 20 millimeters.

LUZON, Nueva Vizcaya Province, near Balete Pass (*Schultze*): Isabela Province, San Antonio (*C. S. Banks*).

This new genus seems to be allied, according to the wing venation, to the genus *Spica*[8] Swinhoe. The species is remarkable on account of its striking geometrid aspect. It was found flying in large numbers during the whole day along the jungle trail near Balete Pass, in the first half of April.

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[8] Proc. Zool. Soc. London (1889) 424; Hampson, Fauna Brit. India, Moths 1 (1892) 342.

ARCTIIDÆ

LITHOSIINÆ

Chionaema benguetana sp. nov. Plate 1, fig. 2.

Forewing bright brick red, basally at upper half a large white patch, from which a narrow oblique white band extends to hind margin. A black line along the outer margin of the white patch and band. In the cell an elongate white patch within which a black round spot is located. A postmedial narrow wavy white band, the inner margin of which is set off by a black line. Hind wing uniformly pale flesh colored. Front of head, collar, and thorax above white, tegulæ, palpi, and legs pale crimson reddish, abdomen pale reddish.

Length of forewing, female, 25 millimeters.

LUZON, Benguet Subprovince, mountains near Irisan, March, 1925 (*Schultze*).

GEOMETRIDÆ

Tigridoptera benguetana sp. nov. Plate 1, fig. 8.

Wings pale slate gray with elongate ochraceous streaks and small black spots. Forewing with an ochraceous streak extending from the discocellular toward the outer margin; basal area also ochraceous and continued as an elongate streak between veins 1a and 1b. Hind wing with two streaks of the same color, one reaching from the base through and beyond the cell, the other between veins 1a and 1b to the postmedial region. Forewing with five subbasal black spots, four above the ochraceous streak and one below, a small black discocellular spot and six or seven spots forming an oblique medial row. Hind wing with a black discocellular spot, also with an oblique medial row and faint traces of a secondary subparallel row of spots. Underside of wings pale slate gray with a rather large discocellular black spot. Head, collar, thorax, first abdominal segment, and legs gray, collar with two black spots, tegulæ streaked with ochraceous and one black spot, thorax with two spots. Second to last abdominal segments pale yellow ochraceous.

Length of forewing, female, 29 millimeters.

LUZON, Benguet Subprovince, Baguio (*F. Sanchez*).

The above species seems to be related to *T. subradiata* Warren [9] but differs from the latter and other [10] related species in that the underside of the hind wing has no black submarginal fascia.

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[9] Novit. Zool. 6 (1899) 48.

[10] Semper, Schmetterl. d. Philippinen 2 (1896–1902) 617.

HYPONOMEUTIDÆ

Ethmia palawana sp. nov. Plate 1, fig. 6.

Forewing creamy white with numerous small black spots as follows: Four spots near base, four others form an irregular oblique antemedial row, in the middle along the subcosta an elongate black streak, and below this a medial and a postmedial black spot. Subapically along costa three small spots and below these a series of five spots. Outer margin with a row of seven small squarish spots. Hind wing pale grayish brown, inner marginal area, in male, with long hair and creamy white cilia. Head, palpi, thorax, and legs also creamy white with black spots. Abdomen ochraceous.

Length of forewing, male, 18.5 millimeters.

PALAWAN, Iwahig (*C. M. Weber*).

This species is related to *E. lineatonotella* Moore [11] from Darjeeling, India, but differs in having only one black line on the forewing and, besides other differences, the color of the hind wing is lighter than in the latter species.

[11] Proc. Zool. Soc. London (1867) 669, pl. 33, fig. 18.

ILLUSTRATIONS

[Original drawings by W. Schultze.]

PLATE 1

FIG. 1. *Silvaspica baletensis* g. et sp. nov.
2. *Chionaema benguetana* sp. nov.
3. *Cyclosia sordidus bungauensis* subsp. nov.
4. *Milleria adalifoides* sp. nov.
5. *Xyleutes plesseni* sp. nov.
6. *Ethmia palawana* sp. nov.
7. *Ancistroceron luzonensis* sp. nov.
8. *Tigridoptera benguetana* sp. nov.

PLATE 2

FIG. 1. *Melanothrix nymphaliaria sanchezi* subsp. nov., male.
2. *Melanothrix nymphaliaria sanchezi* subsp. nov., female.
3. *Melanothrix nymphaliaria sanchezi* var. *baletana* var. nov., female.

TEXT FIGURE

FIG. 1. *Silvaspica baletensis* g. et sp. nov., wing venation.

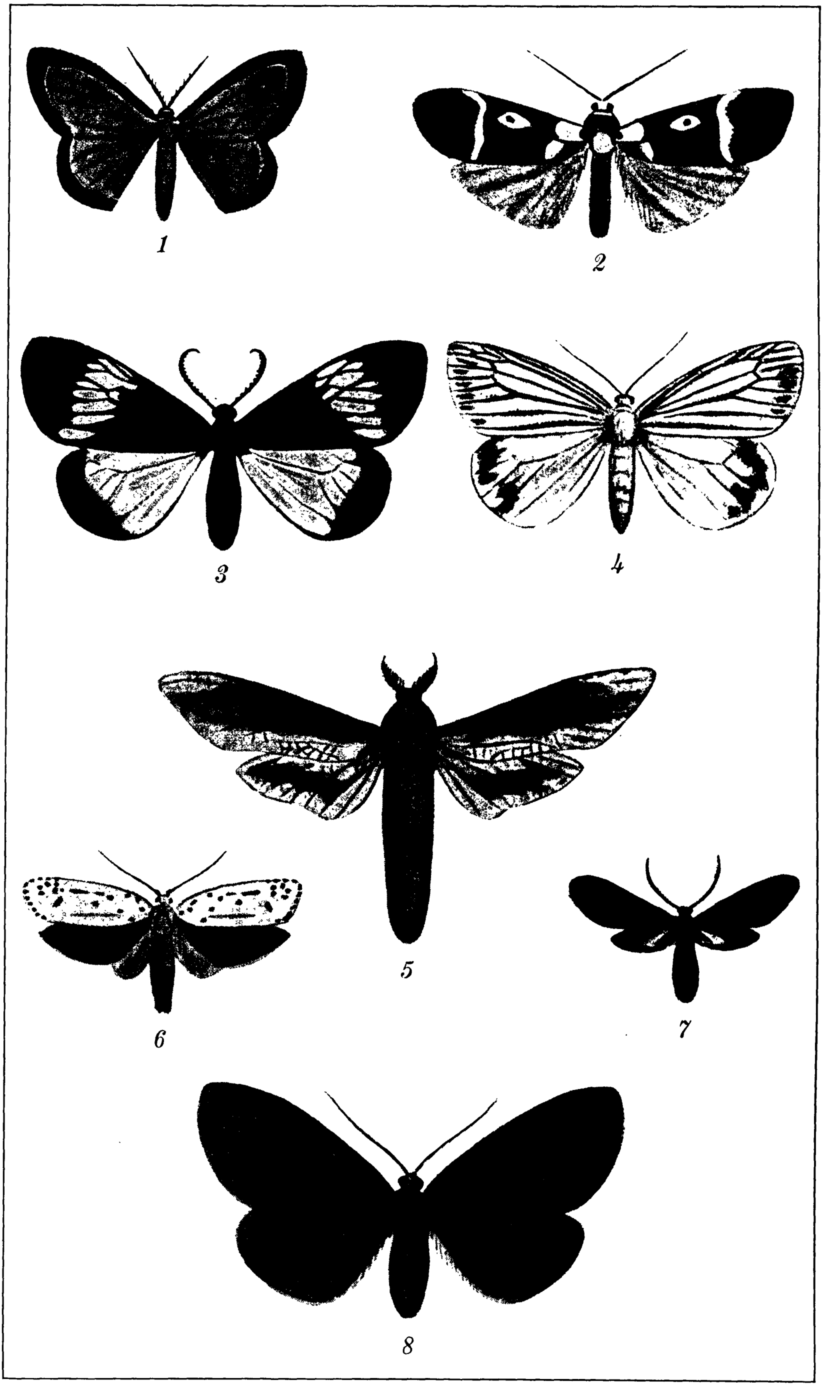
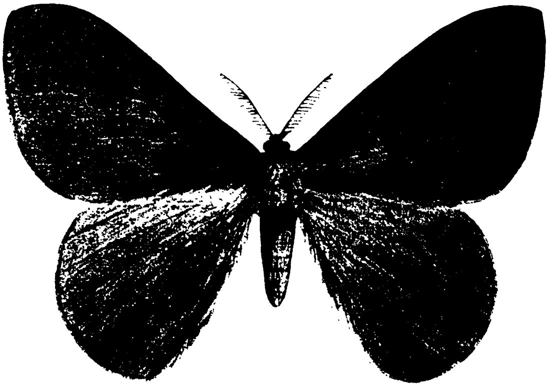


PLATE 1.



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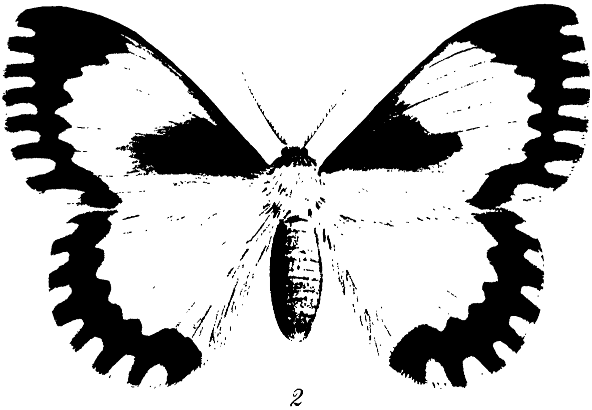

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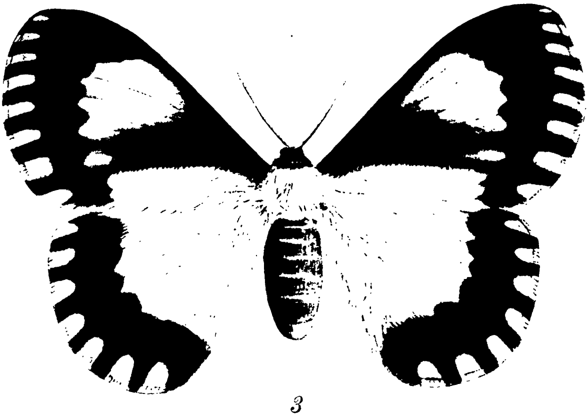

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PLATE 2.

NEUE HOPLIONOTA-ARTEN (COLEOPTERA, CHRYSOMELIDÆ, CASSIDINÆ) AUS DEN PHILIPPINEN, II

Von FRANZ SPAETH

Vienna, Austria

Unter den Cassidinen welche mir Herr Charles F. Baker zur Bestimmung übersandte, befanden sich einige neue *Hoplionota*-Arten. Die Anzahl der von den Philippinen beschriebenen endemischen Arten dieser Gattung ist 24, von welchen 18 durch die Sammeltätigkeit des Herrn Baker gefunden wurden. Ohne zweifel stellt diese Anzahl nur ein kleiner Teil der philippinischen *Hoplionota* dar, und dürfen wir hoffen dass noch mehrere Arten dieser interessanten Gattung gefunden werden.

Hoplionota butuana sp. nov.

Subquadrata, modice convexa, haud nitida, dilute brunnea subtus flavotestacea; crista frontalis oculos sat superans, apice dilatato rotundata et emarginata; prothorax brevis, basi subtruncata, angulis rectangulis, lateribus antice rotundatis; elytra disco striato-punctato, costa dorsali et humerali, illa tuberculo basali mediocri, postbasali parvo, principali sat alto, valde acuto, apicali parvo; carina pontali et suturali, hac abbreviata, apicali, furca interna abbreviata; protectum deplanatum, obsolete punctatum. 5.5 × 5 mm.

MINDANAO, Butuan (*Baker*).

Annähernd rechteckig, um die Hälfte länger als breit, mit der grössten Breite hinter den Schultern noch vor der Mitte der Flügeldecken; von hier nach rückwärts stärker, fast geradlinig, nach vorne kaum verengt; wenig gewölbt, mässig glänzend, braun, die Scheibe des Halsschildes und ihre Umgebung, das Schildchen und der Innenteil des Seitendaches hinter der Basis heller, bräunlichgelb, zum Teil durchscheinend; auch einzelne Teile der Kiele, insbesonders vorne der Dorsalkiel, sind heller als ihre Umgebung; unten bräunlichgelb, nur die Epipleuren hellbraun.

Die Kopfplatte überragt die Augen fast um deren Durchmesser, ist vorne verbreitert, gerundet, die Mitte des Vorderrandes schmal und kurz ausgerandet. Die Fühler reichen nicht bis zu den Halsschildecken,[1] ihr drittes Glied ist sehr klein, kaum halb so lang als das vierte, das vierte bis siebente sind lang, das achte bis zehnte verdickt, kaum länger als breit. Halsschild wie bei *taeniata* gebildet, dreimal so breit als lang, die Basis aussen nur wenig vorgezogen, die Ecken rechtwinklig, die Seiten vor ihnen zuerst noch parallel, dann in starkem Bogen zum Kopfausschnitt gerundet, die Scheibe glatt, mit sehr schwachem vorderen und viel tieferem und kräftiger punktiertem Basalquereindruck, die Seitenflügel mit zerstreuten Grubenpunkten. Flügeldecken kaum merklich breiter als die Basis des Halsschildes, ihre Basis mit ziemlich feinen Punktstreifen und gut ausgebildeten Rippen und Höckern. Der Dorsalkiel ist zwischen dem Basal- und dem Postbasalhöcker kurz unterbrochen; der erstere Höcker ist lang gestreckt, ziemlich hoch, der letztere kleiner; der Haupthöcker liegt etwas weiter aussen, daher die Dorsalrippe hier sich von der Naht entfernt, ist höher als breit, dreimal so hoch als der Basalhöcker, sehr scharf und spitz, vierkielig; der Apikalhöcker ist um die Hälfte niedriger als der Haupthöcker; der Humeralkiel biegt sich an der Basis nach aussen, so dass er ausserhalb der Schulterbeule beginnt, und läuft dann niedrig bis zur Pontalleiste; diese ist aussen schwach, steigt innen auf den Haupthöcker, auf dem sich Längs- und Querkiel in demselben Schnittpunkte treffen, und setzt sich steil abfallend als Suturalleiste bis zum ersten Punktstreif fort; der Apikalkiel ist vollständig, seine drei Anhänge sind kurz, die furca interna erlischt weit von der Pontalleiste entfernt. Das Seitendach hat die gewöhnlichen Grubenpunkte, die aber überall, besonders innen nächst der Seitendachbrücke, sehr seicht und zum Teil erloschen sind.

Hoplionota butuana steht am nächsten der *taeniata* Fabricius, die mir bisher nur von Luzon und Sibuyan, sonach von mehr nördlich gelegenen Inseln der Philippinen vorliegt; sie unterscheidet sich von ihr durch die braune Obserseite ohne rötliche Beimischung, ferner durch kräftiger ausgebildete Höcker, insbesonders den sehr hohen und spitzigen Haupthöcker, bei *taeniata* ist der Haupthöcker niedrig, viel breiter als hoch; ferner ist bei *butuana* der ganze äussere Rand des Seitendaches gleichmässig dunkel, während man bei *taeniata* stets in der Mitte und hinten neben der Spitze helle bis an den Rand reichende Stellen sehen kann und das Seitendach sonach eigentlich je zwei dunkle Randäste hat.

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[1] Die Fühler des Weibchens sind bei den meisten *Hoplionota*-Arten, besonders bei *taeniata*, wesentlich kürzer als beim Männchen.

Hoplionota demutata sp. nov.

Ebenfalls der *H. taeniata* äusserst nahe verwandt, vielleicht sogar nur eine Rasse derselben. Grösser und breiter, nach hinten stärker verengt, oben hell ziegelrot, das Seitendach innen vor der Brücke und an der Spitze heller, in gelb verbleichend. Die Anlage der Rippen und Höcker ist die gleiche, aber die Höcker der Dorsalreihe sind durchwegs höher, der Haupthöcker so hoch als breit, viel höher über die Dorsalrippe hinausragend; die furca interna reicht weiter gegen den Haupthöcker; letzterer ist gegenüber *butuana* viel stumpfer und niedriger; auch ist der Umriss bei dieser viel schmäler. Grösse, 6 × 5 Millimeter.

NEGROS, Cuernos Mountains (*Baker 21500*).

Hoplionota sibuyana sp. nov.

Rotundato-ovata, parum convexa, subnitida, supra sanguinea, subtus testaceorufa epipleuris laete sanguineis; crista frontalis oculos sat superans, antice dilatata, apice rotundato medioque inciso; prothorax brevis, basi extus parum producta, angulis posticis rectangulis, lateribus oblique rotundatis, disco transversim biimpresso ibique punctato, lateribus profundius minus crebre punctatis; elytra punctato-striata, carinis nec tuberculis, illis non interruptis; protectum latum, deplanatum, extus sat crebre punctatum, intus antice sublaeve. 6.2 × 5.2 mm.

SIBUYAN (*Baker*).

Eiförmig-gerundet mit der grössten Breite vor der Mitte der Flügeldecken, von hier zu den Schulterecken wenig, zur Spitze stärker verengt, breiter und gerundeter als alle bisher von den Philippinen bekannten Arten, sehr wenig gewölbt. Die Oberseite lebhaft blutrot, einfarbig, nur die Scheibe des Halsschildes und die weniger dicht punktierte Schwiele auf dem Seitendache innen vor der Seitendachbrücke etwas heller mit gelblichem Stich; die Unterseite rötlich gelb, die Epipleuren hell blutrot, in gelb verbleichend.

Die Kopfplatte überragt die Augen etwa um die Hälfte ihrer Länge, ist vor denselben erweitert, dann im Bogen zugespitzt, mit kurzem Mitteleinschnitt; der Kopf ist zwischen den Augen schmal, schmäler als bei *modesta* Wagener, schwach ausgerandet. Die Fühler erreichen bei weitem nicht die Halsschildecken und haben vier mässig verdickte, eine kurze Keule bildende Endglieder, die wesentlich dicker als lang sind; das siebente Glied ist nur wenig nach dem Ende zu verdickt, gut um die Hälfte länger als das achte; das dritte Glied ist nur so lang als das zweite, das vierte, fünfte und sechste sind nur wenig länger, kürzer als das siebente. Im Verhältnis zu *modesta* sind die Fühler viel kürzer, besonders die Keule ist kürzer und daher anscheinend dicker, das vierte bis siebente Glied sind ebenfalls weniger gestreckt.

Halsschild kurz, dreimal so lang als breit; seine Basis von den Basalzähnen an schwach vorgezogen, die Hinterecken sind rechtwinklig, die Seiten gleich vom Beginn an in sehr schräg verlaufendem Bogen verengt; der Kopfausschnitt ist sehr kurz, mit sehr schrägen Seiten, kürzer und mehr trichterförmig als bei *modesta;* die Scheibe ist bis auf die gewöhnlichen zwei punktierten Quereindrücke glatt; die Seitenflügel haben die gewöhnliche grobe, nicht sehr tiefe Punktierung.

Flügeldecken an der Basis kaum breiter als der Halsschild, mit rechtwinkligen, wenig abgestumpften Schulterecken; die Scheibe mit groben, nur stellenweise regelmässigen Punktstreifen. Die Dorsalrippe ist nur zwischen Basal- und Postbasalhöckerstelle unterbrochen, sonst vollständig; vor dem Haupthöcker ist sie etwas nach aussen gebogen; der Humeralkiel ist im Basalteil erloschen, dann aber bis zur Pontalleiste fast ebenso hoch wie der Dorsal; die Pontalleiste ist ebenso hoch, kräftig, und setzt sich als Suturalleiste schräg nach vorne gerichtet, bis an die Naht fort, mit deren Kante sie sich verbindet; die Apikalleiste beginnt innen vom Dorsal, ohne die Nahtkante zu erreichen; die costa ultima [2] und terminalis, sowie die furca externa und interna sind vollständig ausgebildet; letztere erreicht die Pontalleiste nur wenig weiter innen als der Humeralkiel; Höcker fehlen; die Schnittpunkte des Haupt-, des Apikal- und des Marginalhöckers sind kaum höher als die Rippen. Das Seitendach hat die gewöhnlichen, groben Punkte, welche nur innen vor der Seitendachbrücke eine glatte Beule freilassen; die Aussenrandung ist undeutlich.

Hoplionota impicta sp. nov.

Subquadrata, parum convexa, minus nitida, laete ferruginea, subtus dilutior; crista frontalis oculos sat superans, antice dilatata, apice rotundato medioque inciso; prothorax brevis, basi extus parum producta, angulis posticis subrectis, lateribus oblique rotundatis, disco transversim biimpresso et punctato, lateribus profundius minus crebre punctatis, elytra punctato-striata, carinis modicis hic illic subeffusis, nec tuberculis; protectum latum, subdeplanatum, minus profunde punctatum. 6 × 5 mm.

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[2] Ueber diese Bezeichnungen siehe Spaeth, Verh. Zool. bot. Ges. (1913) 383.

MINDANAO, Surigao (*Baker 17035*).

Rechteckig, nahezu quadratisch, wenig gewölbt und kaum glänzend, rostrot mit gelblichem Stiche, unterseits etwas heller rotgelb. Die grösste Breite liegt in der Mitte der Flügeldecken, von hier nach hinten sehr schwach verengt, hinten breit abgestutzt-verrundet.

Die Kopfplatte überragt die Augen fast um deren ganze Länge, ist längsgerinnt, zwischen den Augen schwach verengt, dann bis zur Mitte der Augen erweitert, an der Spitze verrundet und kurz eingeschnitten. Fühler wie bei *sibuyana,* doch ist das dritte Glied kürzer als das zweite.

Halsschild wie bei *sibuyana,* aber mit etwas spitzer gewinkelten Ecken; auch gleichartig punktiert. Flügeldecken an der Basis von der Breite des Halsschildes, mit rechtwinkligen, kaum abgestumpften Schulterecken, groben, meist regelmässigen Punktstreifen und sehr niedrigen Rippen, ohne Höcker; die Dorsalrippe ist nur nach dem Basalhöcker unterbrochen, sonst vollständig und fast gerade; die Humeralrippe ist an der Basis fast erloschen, dann sehr schwach entwickelt und trifft die Pontalleiste weit aussen; letztere ist niedrig, aber von der Seitendachbrücke bis zur Naht gut erkennbar, als Suturalleiste verläuft sie quer, nicht nach vorne gerichtet. Die Apikalleiste ist rudimentär, beginnt erst aussen von der Dorsalrippe, ohne diese zu berühren; ihre äusseren Fortsätze sind zwar durchwegs vorhanden, aber abgekürzt; die Schnittpunkte sind kaum höher als die Rippen. Das Seitendach ist flach ausgebreitet, grob punktiert, ohne glatte Stellen, breit, mit ziemlich deutlicher Aussenrandung.

Hoplionota impicta steht am nächsten der *sibuyana* und unterscheidet sich von ihr durch die rostrote, mehr gelbliche Färbung, kürzeren, breiteren, nach hinten weniger verengten Umriss, weiter hinten liegende grösste Breite, niedrigere Kiele und Leisten; bei den letzteren bestehen ferner folgende Verschiedenheiten: Der Dorsalkiel ist in der Mitte nicht nach aussen gebogen und wird von der Apikalleiste nicht geschnitten; die Suturalleiste ist nicht nach vorne gebogen und verbindet sich nicht mit der Nahtkante; die furca interna erreicht nicht die Pontalleiste, der Humeralkiel ist an der Basis erloschen, dann gerade.

Hoplionota formosa sp. nov.

Subquadrata, parum convexa, nitida, testaceoflava, elytra utrinque maculis tribus piceis, prima pone callum humeralem, altera circum gibbum principalem, tertia subeffusa in protecto interiore mox pone pontem; crista frontalis magna, oculos valde superans, subacuminata, apice profunde incisa; prothorax disco transversim biimpresso et punctato, ceterum laevi, lateribus profunde punctatis; elytra profunde punctato-striata, gibbo principali ceteris parum altiore, costa humerali et furca interna effusis, costa suturali obliqua, sat alta; protectum latum deplanatum, profunde punctatum. 6.5 × 5.5 mm.

MINDANAO, Surigao (*Baker 17036*).

Eiförmig, rechteckig, um die Hälfte länger als breit, wenig gewölbt, glänzend, bräunlichgelb, auf den Flügeldecken je drei pechschwarze Makeln, die erste zwischen Schulterbeule und Seitendach, die zweite umgibt den Haupthöcker, die dritte ist weniger kräftig und steht hinter der Seitendachbrücke, zum Teil auf dem Seitendach; auch hinter der Apikalleiste ist die Scheibe etwas dunkler, leicht gebräunt, ohne bestimmte Fleckenbildung. Die Fühler überragen die Halsschildecken, das vierte bis siebente Glied sind gestreckt, das achte bis zehnte kurz, kaum länger als dick, die Kopfplatte überragt die Augen um mehr als die Hälfte von deren Länge, ist zwischen ihnen verengt, dann erweitert und zugespitzt zusammenlaufend mit tiefen Schlitz. Halsschild dreimal so breit als lang, wie in den verwandten Arten gebildet und punktiert, mit bis auf die zwei punktierten Quereindrücke glatter, glänzender Scheibe und grob und mässig dicht punktierten Seitenteilen; die Hinterecken sind rechtwinklig, die Seiten vor ihnen erst gerade, dann stark gerundet. Flügeldecken kaum breiter als der Halsschild, an den Seiten nur sehr schwach erweitert, hinten breit verrundet; die Scheibe mit groben Punktstreifen; die Dorsalrippe mit Ausnahme der Unterbrechung zwischen Basal- und Postbasalhöcker vollständig und hoch, am Haupthöcker nach aussen, am Apikalhöcker nach innen gerichtet, ersterer daher weiter von der Naht entfernt; der Basalhöcker lang und ziemlich hoch, der Postbasal unbedeutend, der Haupthöcker und Apikal kaum höher als der Basal; der Humeralkiel ist fast erloschen; die Pontalleiste geht nur vom Haupthöcker bis zum sechsten Punktstreif; die Suturalleiste ist hoch, sehr stark nach vorne zur Naht gerichtet, mit der Nahtkante verbunden; die Apikalleiste ist ziemlich kräftig aber kurz, von ihren Anhängen nur die costa ultima vorhanden, die furca interna und externa fehlen dagegen. Seitendach breiter als eine halbe Flügeldecke, flach ausgebreitet, mit groben, nächst der Seitendachbrücke spärlicheren Punkten.

Hoplionota formosa hat fast die gleiche Zeichnung wie *H. sexnotata* Weise von Luzon, sie ist aber oben mehr braungelb, weniger rötlich; der Umriss ist breiter; ganz verschieden ist die Skulptur der Flügeldecken, da bei *sexnotata* die Suturalleiste gekürzt ist und die Apikalleiste fehlt; auch sind bei ihr die Höcker noch niedriger. Von *H. modesta* Wagener aus Luzon ist *formosa* durch gesättigtere Färbung, andere Zeichnung, längere, verhältnissmässig schmälere Gestalt, viel niedrigeren Haupt- und Apikalhöcker, dichtere Punktierung der Flügeldecken verschieden. Am nächsten steht *formosa* der *H. undulata* Wagener von Mindanao, deren Typus ich besitze. Diese ist mehr gesättigt gefärbt und anders gezeichnet, auf den Flügeldecken wesentlich gröber punktiert, der Haupthöcker ist höher, die Suturalleiste erreicht nicht die Nahtkante, die Apikalleiste setzt sich auch innen über den Dorsalkiel fort, ihre Anhänge sind durchwegs ausgebildet, das Seitendach ist schmäler, ebenso der ganze Umriss; der Halsschild ist etwas länger, seine Scheibe, besonders im vorderen Eindruck, kräftiger punktiert.

Hoplionota negrosia sp. nov.

Subquadrata, parum convexa, subopaca, supra laete ferruginea, subtus parum dilutior testaceo-flava, elytra utrinque maculis duabus nigris, prima in costa pontali, altera in costa apicali; crista frontalis oculos sat superans, apice dilatata et rotundata incisione parva; prothorax disco transversim biimpresso et punctato, ceterum laevi, lateribus punctis magnis, haud profundis, sat sparsis; elytra profunde punctato-striata, bicarinata nec tuberculata, furca interna extus cum pontali conjuncta; protectum latum, deplanatum, obsolete punctatum. 7 × 6 mm.

NEGROS, Cuernos Mountains (*Baker*).

Rechteckig, kaum um die Hälfte länger als breit, bald nach den Schultern am breitesten, nach vorne und hinten nur wenig verengt, hinten breit gerundet, kaum glänzend, unten rötlich gelb, die Oberseite hell rostrot mit gelblicher Beimischung, innen auf dem Seitendache vor der Pontalbrücke und auf dem Vordache wenig heller durchscheinend, mit zwei schwarzen Flecken auf jeder Flügeldecke; der erste liegt auf der Pontalleiste und ihrer Umgebung, ist quer und reicht vom Schnittpunkt mit dem Humeralkiel bis zu jenem mit dem Dorsalkiel, also dem Haupthöcker; der zweite liegt über der Apikalleiste, ebenfalls quer und mit derselben Ausdehnung; in beiden Fällen sind auch die Fortsätze der Querleisten gegen die Naht anfangs schwarz.

Die Kopfplatte ist ähnlich wie bei den vorherigen Arten, kürzer vor die Augen vorgezogen, vorne breit gerundet, mit sehr kleinem, kurzen Einschnitt. Die Fühler reichen nicht bis zu den Halsschildecken, ihr drittes Glied ist wenig kürzer als das zweite, die äusseren Glieder sind fast um die Hälfte breiter als lang. Halsschild kurz, dreimal so breit als lang, mit aussen kaum vorgezogener Basis, rechtwinkligen Ecken und anfangs geraden, dann stark gebogenen Seiten; die wenig glänzende Scheibe hat die gewöhnlichen zwei punktierten Quereindrücke, die Seitenteile haben sehr verloschene, grobe Punkte, die ziemlich spärlich stehen. Die Flügeldecken sind so breit als der Halsschild, mit groben Punktstreifen auf der Scheibe; der Dorsalkiel ist nicht unterbrochen und reicht fast bis sur Spitze; er ist am Haupthöcker kaum nach aussen gebogen; die Höcker auf ihm sind niedrig, kaum als solche erkennbar. Eine bemerkenswertere Bildung zeigt der etwas niedrigere Humeralkiel; er beginnt schon an der Basis auf dem sechsten Zwischenraum, geht dann parallel mit dem Dorsalkiel bis zur Pontalleiste und setzt sich auch nach dieser als furca interna auf demselben Zwischenraum bis zur Apikalleiste fort während sonst diese furca entweder zum Haupthöcker wendet oder erlischt; die anderen drei Nebenleisten der Apikalleiste sind abgekürzt. Die Pontalleiste ist aussen erloschen und setzt sich als Suturalleiste schräg nach vorne zur Naht fort, ohne letztere zu erreichen; die gleiche Bildung zeigt die Apikalleiste. Das Seitendach ist breit, ausgebreitet, mit groben, aber sehr seichten und stellenweise verloschenen Grubenpunkten und einer glatteren, helleren Stelle innen vor der Seitendachbrücke.

In Grösse, Färbung, und Zeichnung erinnert *H. negrosia* an *sexnotata* Weise; sie unterscheidet sich jedoch von dieser, sowie von allen anderen Arten der Philippinen, durch den Verlauf der furca interna.

Hoplionota delicatula sp. nov.

Breviter ovalis, modice convexa, nitida, flavotestacea, elytra maculis utrinque duabus nigris, prima ad callum humeralem, altera in costa pontali; crista frontalis oculos valde superans; antennae sat breves, articulis 4 ultimis clavam formantibus; prothorax brevis, longitudine triplo latior, angulis posticis rectangulis, lateribus valde rotundatis, disco transversim biimpresso, lateribus profunde sat crebre punctatis; elytra prothorace parum latiora, mox pone humeros latissima, tum lateribus parum obliquatis, disco sat fortiter punctato-striato, costis duabus longitudinalibus, humerali fere obsoleta, costa pontali parum altiore, apicali parva, furcis abbreviatis; protectum deplanatum, profunde, sat crebre punctatum. 5.5 × 5 mm.

MINDANAO, Butuan (*Baker 18857*).

Diese und die folgenden zwei Arten gehören in eine Gruppe sehr ähnlicher Formen, von denen bereits früher *H. sexsignata* von Weise [3] beschrieben wurde und die bisher nur von Mindanao, und zuweilen ausschliesslich aus den Ausbeuten von Ch. F. Baker bekannt wurden.

Hoplionata delicatula hat einen breit-ovalen, schwach trapezförmigen Umriss; die grösste Breite liegt knapp hinter den Schultern; von hier verengt sie sich nach rückwärts mehr und geradlinig, nach vorne schneller, aber nur kurz. Nur unbedeutend länger als breit, mässig gewölbt, ziemlich glänzend, hell bräunlichgelb, auf jeder Flügeldecke mit zwei schwarzen Makeln; die erste kleinere an der Basis des Humeralkiels, innen von der Schulterbeule; die zweite umgibt die Pontalleiste von ihrem Schnittpunkt mit dem Humeralkiel bis über den Haupthöcker.

Die Kopfplatte überragt die Augen um ihren Durchmesser, ist vorne zuerst erweitert, dann breit abgerundet, mit schmalem Einschnitt. Die Fühler sind kurz, reichen nicht bis zu den Halsschildecken und haben vier verdickte Endglieder, die merklich breiter als lang sind; das dritte Glied ist kürzer als das zweite, das vierte kaum länger. Halsschild kurz, dreimal so breit als lang, mit aussen kaum vorgezogener Basis, rechtwinkligen Ecken, dann zuerst geraden, sodann stark gebogenen Seiten; der vordere Quereindruck der Scheibe ist schwach, kaum punktiert; die Seitenflügel tragen grobe, ziemlich dicht stehende Punkte. Die Basis der Flügeldecken ist kaum breiter als der Halsschild; die Punktstreifen der Scheibe sind grob, wenig regelmässig. Die Dorsalrippe ist zwar niedrig, aber gut erkennbar; hinter dem Basalhöcker unterbrochen, nach dem Postbasal kaum eingesenkt, vor dem Haupthöcker stark nach aussen gebogen; hinter diesem setzt sie sich weiter innen fort, so dass kein gemeinsamer Schnittpunkt mit der Pontalleiste für ihren vorderen und rückwärtigen Teil im Haupthöcker entsteht, und wendet sich dann im Apikalhöcker wieder näher zur Naht; die auf ihr liegenden Höcker sind alle klein, auch der Haupthöcker. Die Humeralrippe beginnt an der Basis, wo sie sich kurz nach aussen biegt und erlischt weit vor der Pontalleiste; hinter der Schulterbeule sendet sie einen kleinen Ast nach vorne und aussen; die Pontalleiste ist in der Mitte hoch, im Haupthöcker kurz nach hinten gebogen und setzt sich als Suturalleiste, sehr wenig nach vorne gezogen, bis an die Naht fort; die Apikalleiste hat einen kurzen Ansatz innen vom Apikalhöcker; von ihren Anhängen ist nur die costa ultima lang, dagegen sind die furca interna und externa ganz kurz rudimentär. Das Seitendach ist flach ausgebreitet, breit, überall gleich dicht, grob punktiert.

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[3] Deutsche Ent. Zeitschr. (1915) 510.

Hoplionata delicatula ist, wie schon erwähnt, der *H. sexsignata* Weise, die von Surigao beschrieben wurde, sehr nahe verwandt; ich beziehe auf *sexsignata* ein von Baker erhaltenes Stück, No. 16237 meiner Sammlung, vom gleichen Fundorte. Leider hat Weise die Beschreibung der Rippenbildung so kurz gefasst, dass die Deutung meines Stückes vielleicht nicht ganz verlässlich ist. Die Zeichnung der Makeln stimmt mit der vom Autor angegebenen, nur ist die Basalmakel bei meinem Stücke nur biz zum siebenten, statt bis zum neunten Streif ausgedehnt. Von *delicatula* unterscheidet sie sich durch schmäleren, verhältnismässig längeren Umriss, längeren Halsschild, hinten weniger verengte Flügeldecken, sparsamere Grubenpunkte auf den Seitenflügeln des Halsschildes und dem Seitendache, regelmässigere, feinere Punktstreifen der Flügeldecken, abgekürzte Suturalleiste, niedrigeren Haupthöcker sammt Pontalleiste und (von rückwärts gesehen) steilen, zum Seitendache abfallenden Flügeldecken; natürlich auch durch die verschiedene Zeichnung, bei welcher besonders zu erwähnen ist dass bei *sexsignata* die mittlere Makel auf und hinter der Pontalleiste liegt, bei *delicatula* aber von dieser Leiste fast in ihrer Mitte geschnitten wird.

Hoplionota corpulenta sp. nov.

Der vorigen sehr ähnlich, so dass die Angabe der Unterschiede genügt: Höher gewölbt und nach den Seiten steiler abfallend, schmäler, mit verhältnismässig längerem Halsschild und schmälerem Seitendach der Flügeldecken; letztere haben jederseits nur eine schwarze Makel, die aber viel grösser und fast rund ist, vom dritten bis zum achten Punktstreif reicht, also innen den Haupthöcker, aussen den Humeralkiel weit überschreitet; auch nach vorne und hinten ist sie weiter ausgedehnt. Die Dorsalrippe ist niedriger, hinter dem Basalhöcker ebenfalls unterbrochen, im Haupthöcker nicht höher als gewöhnlich; die Humeralrippe ist fast so kräftig als die Dorsal, bis zur Pontalleiste fortgesetzt; letztere fällt vom Dorsal- zum Humeralkiel viel weniger ab, ist aber niedriger als bei *delicatula;* die Apikalleiste ist sehr schwach, hat aber ihre vorderen Anhänge länger entwickelt; die Suturalleiste ist abgekürzt.

MINDANAO, Surigao (*Baker*).

Hoplionota surigaoensis sp. nov.

Von der sehr ähnlichen *H. sexsignata* Weise vor allem dadurch unterschieden, dass bei *surigaoensis* der vordere und der rückwärtige Teil des Dorsalkiels sich im Haupthöcker in einem Schnittpunkte treffen; bei *sexsignata* trifft wie bei *delicatula* der vordere Teil die Pontalleiste weiter innen als der äussere. Ferner ist *surigaoensis* kleiner und weniger gewölbt, mit viel dichteren Grubenpunkten auf Vor- und Seitendach; die vier Höcker des Dorsalkiels sind viel höher, deutlich erkennbar, der Humeralkiel an der Basis erloschen, der Dorsal in der Mitte weniger nach aussen gebogen. Auf jeder Flügeldecke sind vier pechschwarze Flecke: der erste auf der Schulterbeule, der zweite um den Basalhöcker, beide länglich; der dritte quer, auf der Pontalleiste zwischen ihren beiden Schnittpunkten, nach aussen also viel weniger weit ausgedehnt als bei *sexsignata,* der letzte hinter der Apikalleiste gross und rundlich. Grösse, 5 × 4.2 Millimeter.

Von *delicatula* und *corpulenta* ist *surigaoensis* ausser der verschiedenen Zeichnung durch schmäleren, nach hinten weniger verengten, weniger gewölbten Körper und den Schnittpunkt des Dorsalkiels verschieden.

MINDANAO, Surigao (*Baker 17034*).

BRENTHIDEN DER ENTOMOLOGISCHEN SAMMLUNG DES BUREAU OF SCIENCE, SOWIE EINIGE NEUE ARTEN AUS DER BOETTCHER'SCHEN AUSBEUTE

Von R. KLEINE
Stettin, Germany

EINE TAFEL

Herr W. Schultze, Entomologe des Bureau of Science, sandte mir das nachstehend bearbeitete Brenthidenmaterial. Das meiste sind natürlich bekannte Arten, zum Teil erst in neuester Zeit von mir beschrieben, eine kleine Anzahl ist aber neu und bringt ganz merkwürdige Formen, die im Faunengebiet noch nicht bekannt waren. Ich habe von allen Arten den Fundort mitgeteilt, da es mir für die zoogeographischen Forschungen der philippinischen Inselwelt von Wichtigkeit erscheint, die Verbreitung der einzelnen Arten genau kennen zu lernen. Der Charakter der philippinischen Brenthidenfauna scheint mir kein einheitlicher zu sein und es ist eine dankbare und interessante Aufgabe, die Beziehungen der Inseln zu einander und zu den anliegenden Gebieten, den indo- und austro-malayischen, kennen zu lernen.

CALODROMINI

Genus **CALODROMUS** Guérin-Méneville

Calodromus GUÉRIN-MÉNÉVILLE, Mag. Zool. (1832) t. 34.

Calodromus mellyi Guérin-Méneville.

Calodromus mellyi GUÉRIN-MÉNÉVILLE, Mag. Zool. (1832) t. 34.

LUZON, Ilocos Norte, Bangui (*C. S. Banks*).

Im ganzen orientalischen Gebiet, nur von Java sah ich die Art noch nicht. Auf den Philippinen schon mehrfach gefunden worden.

Genus **CYPHAGOGUS** Parry

Cyphagogus PARRY, Trans. Ent. Soc. London 5 (1849) 182.

Cyphagogus eichhorni Kirsch.

Cyphagogus eichhorni KIRSCH, Mitt. Zool. Mus. Dresden 1 (1875) 45.

NEGROS, Occidental Negros (*W. Schultze*). MINDANAO, Davao (*C. M. Weber*).

Sehr weitverbreitete Art (Assam, Molukken). Auf den Philippinen mehrfach aufgefunden.

Cyphagogus longulus Senna.

Cyphagogus longulus SENNA, Notes Leyd. Mus. 20 (1898) 52.

MINDANAO, Davao, Cabadbaran (*Weber*); Kolambugan, Lanao (*Banks*).

Von Malakka bis zu den Molukken gefunden worden. Für die Philippinen neu.

Cyphagogus tabacicola Senna.

Cyphagogus tabacicola SENNA, Bull. Soc. Ent. Ital. (1893) 294.

MINDANAO, Lanao, Kolambugan (*Banks*). LUZON, Laguna, Mount Maquiling (*C. F. Baker*).

Sehr verbreitete Art, von Indien bis zu den Philippinen in ununterbrochener Folge. Für die Philippinen neu.

Cyphagogus humilis sp. nov.

Braun, Vorderrand des Prorostrums und die Tarsen etwas heller; am ganzen Körper glänzend. Kopf gewölbt, einzeln punktiert, gegen den Hals keilförmig verengt, über den Augen keine Punktfurche. Rüssel so lang wie der Kopf, wenig verschmälert, Vorderrand flach eingebuchtet, Punktierung dichter und kräftiger als auf dem Kopfe. Drittes Fühlerglied kegelig, das vierte bis achte quadratisch oder breiter als lang, das neunte bis elfte bedeutend breiter und länger, das neunte und zehnte etwa quadratisch, das elfte stumpf-konisch, so lang wie das neunte und zehnte zusammen; Behaarung zart. Thoracalconus deutlich, Punktierung in Grösse und Tiefe wechselnd, Behaarung immer kurz, hell. Die zweite Rippe auf den Elytren in der Mitte stark verengt; Behaarung kurz. Vorderschienen mit kleinem, deutlichem Haarbüschel, Hinterschenkel an der Keule oben und unten schwach aber deutlich verengt, Metatarsus kegelig, so lang wie das zweite und dritte Glied zusammen, Klauenglied kegelig, Behaarung doppelt. Kurze Unterbehaarung mit einzelnen sehr langen Haaren vermischt. Metarostrum und Abdomen stark punktiert.

Länge (total), 5 Millimeter; Breite (Prothorax), 0.80 Millimeter, circa.

MINDANAO, Lanao, Kolambugan (*Banks*).

Es besteht eine grosse Aehnlichkeit mit *obconiceps* Senna. Die Differenzen sind folgende: Die Punktierung ist auf dem Rüssel anders als auf dem Kopf, letzterer ist nur ganz zart, der Rüssel dagegen intensiv und dicht punktiert. Schienen der Vorderbeine mit deutlichen Haarbüscheln, der Stiel der Hinterschenkel oben und unterseits verengt, Keule kräftig, kürzer als der Stiel, Klauenglied nicht walzig, sondern kegelig.

Genus **EPIGOGUS** Kleine

Epigogus KLEINE, Ent. Bl. 19 (1923) 159.

Epigogus flexibilis Kleine.

Epigogus flexibilis KLEINE, Ent. Bl. 19 (1923) 159.

NEGROS, Occidental Negros, Fabrica (*Schultze*); von Negros schon bekannt.

Genus **ORTHOPAREIA**[1] novum

Von robuster Gestalt, einem *Glaucocephalus* ähnlich. Kopf breiter als lang, Hinterrand gerade, gewölbt, ungefurcht, Hinterecken scharfkantig, Seiten mit platten, geraden Wangen, ungezähnt, Unterseite an der Basis keilförmig vertieft; Augen klein, vorgerückt. Rüssel sehr kurz, Metarostrum oberseits schmäler als der Kopf, gefurcht, Mesorostrum erweitert, gefurcht, Prorostrum an der Basis stark verengt, nach dem Vorderrand erweitert, im schmalen Teil gefurcht, Vorderrand in der Mitte flach eingebuchtet; Mandibeln dem Vorderrand anliegend, klobig. Fühler bis auf die Mitte des Prothorax reichend, das erste Glied gross, das zweite ohne Stiel, etwas breiter als lang, das dritte kegelig, länger als breit, das vierte bis achte quadratisch, das neunte vergrössert, das neunte länger als breit, Basis gerundet, Vorderrand gerade, das zehnte kürzer, von gleicher Gestalt, das elfte stumpf-konisch, so lang wie das neunte und zehnte zusammen, Behaarung mittelstark, das neunte bis elfte Glied mit kurzer Unterbehaarung. Prothorax gedrungen, eiförmig-elliptisch, grösste Breite hinter der Mitte, gewölbt, in den basalen zwei Dritteln tief gefurcht, am Halse seitlich stark verengt, oberseits durch einen breiten Quereindruck vom Halse getrennt. Elytren breit, Basis flach schräg, Seiten gerade, Hinterrand in einer stumpfen, mittleren Spitze endigend; Sutura breit, parallel, die zweite Rippe schmal, in der Mitte lang unterbrochen, die dritte sehr breit und flach, auf dem Absturz verschmälert und erhöht, die vierte schmal, die fünfte breit, die sechste schmal, die siebente bis zehnte breit, Furchen so breit wie die schmäleren Rippen. Beine gedrungen, Vorderschenkel

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[1] ὀρθός, gerade; παρειά, Wange.

sehr breit, Schienen lang-keilförmig, normal gedornt, Tarsen normal, Mittelbeine zart, den vorderen ähnlich, Hinterschenkel nicht über die Elytren hinausragend, Keule mässig dick, Schienen lang-dreieckig, Metatarsus so lang wie das zweite und dritte Glied zusammen, Klauenglied zart, keulig. Metasternum, erstes und zweites Abdominalsegment zart längsgefurcht, Quernaht nur an den Seiten deutlich.

Genotypus, *Orthopareia idonea* sp. nov.

Die Gattung ist in die Nähe von *Callipareius* Senna zu bringen, von der sie sich durch folgende Merkmale leicht unterscheiden lässt: Die Gestalt ist nicht schlank, sondern auffällig gedrungen und sieht einem *Glaucocephalus* sehr ähnlich. Kopf und Fühler sind *Callipareius* ähnlich. Der Prothorax ist nicht schlank, sondern sehr gedrungen und, mit Ausnahme des vorderen Drittels, tief gefurcht. Die Elytren sind gleichfalls sehr gedrungen, durch die wechselnde Stärke der Rippen und der weit unterbrochenen zweiten Rippe gekennzeichnet. *Callipareius* ist von schlanker, *Orthopareia* von gedrungener Gestalt; die Verwandtschaft liegt in der Form von Kopf und Rüssel. Die neue Gattung hat sich unmittelbar *Callipareius* anzuschliessen.

Orthopareia idonea sp. nov.

Kastanienbraun in wechselnder Tiefe. Kopf und Rüssel einzeln punktiert, Unterseite punktiert und borstig behaart. Prothorax neben der Furche und auf den Aussenkanten punktiert und kräftig behaart, seitlich bis zu den Hüften reichend. Elytren mit punktierten und behaarten Rippen. Beine, namentlich die Schenkel, stark behaart. Metasternum kaum sichtbar punktiert, in der Mittelfurche zottig behaart. Das erste und zweite Abdominalsegment seitlich querfurchig, Punktierung gering, nur an der Basis des ersten Segments behaart, das dritte bis fünfte Segment dicht punktiert, das fünfte sehr dicht.

Länge (total), 7 Millimeter; Breite (Prothorax), 1.5 Millimeter.

LUZON (*Webb*).

Genus **OPISTHENOXYS** Kleine

Opisthenoxys KLEINE, Arch. Nat. A 10, 87 (1921) 26.

Opisthenoxys ochraceus Kleine.

Opisthenoxys ochraceus KLEINE, Arch. Nat. A 10, 87 (1921) 28.

NEGROS, Occidental Negros, Fabrica (*Schultze*).

Auf den Philippinen sehr häufig. Die vorliegenden Individuen waren in Grösse und Färbung sehr variabel.

Opisthenoxys boettcheri sp. nov.

Männchen.—Hellgelbbraun bis kastanienbraun, nur die Elytren auf der Mitte mit einer dunklen Makel, die nicht über die sechste Rippe hinausgeht; mit Ausnahme der angegebenen Organe stark glänzend. Kopf tief dreieckig eingekerbt, die Hinterecken gegen den Hals etwas vorstehend, matt, grob skulptiert und dicht, kurz beborstet; Augen gross, am hinteren Augenrand einige kurze Borsten. Meta- und Mesorostrum gefurcht, wie der Kopf skulptiert, Prorostrum schlank, glänzend. nadelstichig punktiert und kurz behaart. Das zweite Fühlerglied länger als das dritte, das dritte bis achte perlig, gleichlang, das neunte bis elfte vergrössert, platt, das elfte kürzer als das neunte und zehnte zusammen. Prothorax platt, am Halse oberseits und seitlich eingedrückt, Punktierung sehr zart und zerstreut, nur am Hinterrand und in den Vertiefungen am Halse grob punktiert und kurz behaart. Elytren von normaler Gestalt, erste bis dritte Rippe breiter als die folgenden, auf den Rippen entferntstehend beborstet, Gitterung deutlich. Beine ohne besondere Merkmale.

Länge (total), 3.5 bis 4 Millimeter; Breite (Prothorax), 0.75 Millimeter, circa.

MINDANAO, Point Banga (*Böttcher*).

Holotypus im Dresdener Museum, Paratypus in meinem Besitz.

Von *ochraceus* trennen die anders geformten Fühler. Bei jener Art ist das dritte Fühlerglied immer länger als das zweite und vierte bis achte, hier ist das zweite das längste. Von allen bekannten Arten trennt die Form des Kopfes und die starke Beborstung desselben.

Genus **ATOPOMORPHUS**[2] novum

Von gedrungener Gestalt. Kopf viel breiter als lang, Hinterrand flach nach innen gebuchtet, platt, hinten und seitlich scharfkantig, Unterseite backenartig erhöht, mit flacher Mittelfurche, Augen gross, fast den ganzen seitlichen Kopf einnehmend, prominent. Rüssel so breit wie der Kopf und von demselben nicht getrennt, eine platte, zusammenhängende, fast parallele, gebogene Ebene bildend, keine Furchen, Vorderrand flach nach innen gebuchtet; Mandibeln klein, ganz unter dem Vorderrand des Prorostrums verborgen. Das erste Fühlerglied walzig, das zweite und vierte bis achte quer, perlig, das dritte kegelig, etwas länger als breit, das neunte bis elfte vergrössert, das neunte kleiner als das zehnte. Das neunte etwa quadratisch, das zehnte länger als breit, das elfte stumpf-konisch, kaum so lang wie das neunte und zehnte zusammen. Prothorax eiförmig, grösste Breite im hinteren Drittel, gegen den Hals stark verengt, Oberseite gewölbt, ungefurcht. Elytren gedrungen, seitlich fast parallel, gegen den Absturz rundlich verschmälert, gemeinsam abgerundet, gerippt gefurcht. Die erste und zweite Rippe breiter als die folgenden, die unter sich alle gleich breit sind, alle Rippen platt, Furchen so breit wie die Rippen glatt, unpunktiert. Vorderbeine kurz, Schenkel breit, Schienen und Tarsen normal, Mittelbeine schlank, Hinterschenkel kaum über die Elytren reichend, Stiel schlank, Keule kräftig, Schienen nach innen blattartig erweitert, Metatarsus so lang wie das zweite und dritte Glied, Klauenglied zart, keulig.

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[2] ἄτοπος, curios; μορΦή, Gestalt.

Genotypus, *A. schultzei* sp. nov.

Habituell besteht einige Aehnlichkeit mit der Gattung *Dyscheromorphus* Kleine, die durch die anders geformten Schienen in eine ganz andere Verwandtschaft gehört. Die Gestalt ist ameisenartig. Der Kopf ist mit dem Rüssel einheitlich verbunden, so dass oberhalb keine Trennung dieser beiden Organe erkennbar ist. Die Fühler sind in grossen, den vorderen Teil des Rüssels einnehmenden Gruben eingefügt. In meiner Bestimmungstabelle kommt man zu *Adidactus* Senna, mit der keinerlei Beziehungen bestehen, ausgenommen die erweiterten Hinterschienen. Es liegt also in *Atopomorphus* ein intermediärer Typus vor.

Atopomorphus schultzei sp. nov. Tafel 1, Fig. 1, 2, und 3.

Kastanienbraun, glänzend. Kopf an der Basis grob, der übrige Teil und der Rüssel zart aber dicht punktiert, Kopf borstig behaart, Rüsselvorderrand mit einzelnen zarten Härchen, seitliche Behaarung (Tafel 1, Fig. 1). Fühler seidig, mittellang behaart. Unterbehaarung des neunten und elften Gliedes gering. Prothorax auf der Oberseite grob aber zerstreut punktiert, in den Punkten zart behaart, nach den Seiten lässt die Skulptur nach, Prosternum unpunktiert. Elytren auf den Rippen weitläufig punktiert, in den Punkten abstehend behaart. Beine ganz allgemein nur zerstreut behaart.

Länge (total), 4 Millimeter; Breite (Prothorax), 1 Millimeter, circa.

NEGROS, Occidental Negros, Fabrica (*Schultze*).

Sammler, W. Schultze, dem ich dies interessante Tier widme.

STEREODERMINI

Genus **CEROBATES** Schoenherr

Cerobates SCHOENHERR, Gen. Curc. 5 (1840) 487.

Cerobates tristriatus Fabricius.

Cerobates tristriatus FABRICIUS, Syst. El. 2 (1801) 554.

LUZON, Laguna, Magdalena (*Schultze*); Ilocos Norte, Bangui, (*Banks*). MINDANAO, Davao, Cabadbaran (*Weber*).

Im ganzen orientalischen Gebiet in starker Variation verbreitet.

TRACHELIZINI

Genus **HOMOPHYLUS** Kleine

Homophylus KLEINE, Zool. Meded. Leyden 4^5 (1920) 244.

Homophylus mindanensis sp. nov.

Männchen.—Rotbraun, Halsrand, Rüsselseiten und eine postmediane Makel dunkel, am ganzen Körper hochglänzend. Kopf sehr zart und zerstreut punktiert, mit sehr schwacher, flacher Mittelfurche, zwischen den Augen grubig vertieft, Hinterrand und Unterrand bis zum mittleren Auge filzig. Meta- und Mesorostrum kräftig gefurcht, Prorostrum in der basalen Hälfte platt, Punktierung kräftiger als auf dem Kopf. Fühler normal. Prothorax desgleichen. Elytren auser der Sutura nur mit einer schmalen, durchgehenden Rippe, nur auf dem Absturz Rudimente weiterer Rippen, die durch grobe, filzige Punkte getrennt sind, jede weitere Punktierung fehlt. Metatarsus aller Beine nicht länger als das zweite Glied.

Länge (total), 6.5 Millimeter; Breite (Prothorax), 1 Millimeter, circa.

MINDANAO, Surigao (*Böttcher*).

Holotypus im Dresdener Museum.

Die Gattung kommt also nicht nur in Java vor. Die am nächsten stehende Art ist *durus* Kleine, die Unterschiede sind folgende: Die Rippenrudimente finden sich nicht an der Basis, sondern auf dem Absturz, jede Reihenpunktierung fehlt, die Elytren sind spiegelglatt. Der Metatarsus aller Beine ist nicht länger als das zweite Glied.

Genus **TRACHELIZUS** Schoenherr

Trachelizus SCHOENHERR, Gen. Curc. 5 (1840) 489.

Trachelizus bisulcatus Fabricius.

Trachelizus bisulcatus FABRICIUS, Syst. El. 2 (1801) 548.

MINDANAO, Davao, Cabadbaran (*Weber*).

Gemein von Ostindien bis zur Ostküste Australiens.

Genus **MIOLISPA** Pascoe

Miolispa PASCOE, Journ. Ent. 1 (1862) 393.

Miolispa bicolor Kleine.

Miolispa bicolor KLEINE, Stett. Ent. Ztg. 80 (1919) 316.

LUZON, Nueva Vizcaya, Imugan (*Banks*).

Nur von den Philippinen bekannt geworden.

Miolispa unicolor Kleine.

Miolispa unicolor KLEINE, Stett. Ent. Ztg. 80 (1919) 314.

LUZON, Nueva Vizcaya, Imugan (*Banks*).

Nur von den Philippinen bekannt.

Miolispa pulchella Kleine.

Miolispa pulchella KLEINE, Arch. Nat. A 10, 87 (1921) 29.

LUZON, Nueva Vizcaya, Imugan (*Banks*).

Nur von Luzon bekannt.

Miolispa fornicata Kleine.

Miolispa fornicata KLEINE, Ent. Bl. 19 (1923) 161.

Von dieser Art lagen mir circa 20 Exemplare aus der Böttcher'schen Ausbeute vor, alle vom gleichen Fundort. Es zeigte sich, dass die Variabilität eine ganz auffällig grosse war. Die braune Körperfarbe kann gänzlich schwarz werden, nur die dritte Rippe bleibt gelb. Der Prothorax ist von sehr wechselnder Gestalt, schlank eiförmig bis breit-elliptisch in allen Uebergängen. Auch die Punktierung ist recht wechselnd, kann sehr ansehnlich sein, aber bis auf eine Punktreihe am Hinterrand ganz zurückgehen. Es kommen Exemplare mit mehr oder weniger rotem Prothorax vor. Ein wichtiges diagnostisches Merkmal hat sich noch ergeben, das der Type fehlt: die Elytren sind einzeln aber ansehnlich behaart, die Behaarung ist aber, wie es scheint, recht hinfällig. Spuren von Behaarung waren immer noch nachweisbar.

Miolispa clavicornis Kleine.

Miolispa clavicornis KLEINE, Arch. Nat. A 10, 87 (1921) 30.

Es kommen dieselben Variationen wie bei *fornicata* vor.

AMORPHOCEPHALINI

Genus **LEPTAMORPHOCEPHALUS** Kleine

Leptamorphocephalus KLEINE, Arch. Nat. A 12, 82 1916 (1918) 132.

Leptamorphocephalus sumatranus Senna.

Leptamorphocephalus sumatranus SENNA, Notes Leyd. Mus. 16 (1894) 195.

PALAWAN, Silanga (*E. D. Merrill*).

Das Auffinden dieser Art auf Palawan bestätigt meine schon früher geäusserte Ansicht, dass diese Insel mit den Philippinen nichts gemein hat und dem grossen asiatischen Landmassiv angehört. Auf den Philippinen kommt die Art nicht mehr vor.

Genus **PARAMORPHOCEPHALUS** Kleine

Paramorphocephalus KLEINE, Zool. Meded. Leyden 4^5 (1920) 236.

Paramorphocephalus setosus sp. nov. Tafel 1, Fig. 4.

Weibchen.—Rotbraun, Prorostrum, Fühler, Halsrand, Schenkel, und Schienen an Basis und Spitze in mehr oder weniger grossem Umfang und die Tarsen schwärzlich, Glanz mittelstark, Prothorax und Elytren matt. Kopf quer, drei- bis viermal so breit als lang, mit schmaler, flach nach innen abschüssiger Mittelfurche, überall mit einzelnen langen, nach vorngerichteten, in Poren stehenden Haaren besetzt; Augen seitlich prominent; Unterseite mit einzelnen kurzen, anliegenden Haaren besetzt. Metarostrum schildförmig (Tafel 1, Fig. 4), steil ansteigend, an den Seitenrändern mit tiefen Poren, in denen nach vorn kurze, nach hinten zu lange Haare stehen, sonst nur sehr schwach skulptiert, Prorostrum rundlich-walzig, kräftig punktiert, Unterseite mit einzelnen Poren. Fühler nodos, vom dritten bis achten etwas kürzer werdend, neunte und zehnte wieder länger, tonnenförmig, elfte walzig, so lang wie das neunte und zehnte zusammen, erste bis achte einzeln lang beborstet, neunte bis elfte dicht, kurz behaart. Prothorax kurz, walzig, mit einzelnen grossen Poren, die auf der Oberseite lang behaart sind. Elytren glatt, Rippen und Furchen nur durch einzelne Poren angedeutet, in den Rippenporen mit langen Haaren besetzt.

Beine normal, keine Verbreiterung der Schenkelstiele, mit Ausnahme der Tarsen einzeln punktiert und in den Punkten lang behaart. Metasternum an der Basis schmal gefurcht, Abdomen ungefurcht, Punktierung überall einzeln aber kräftig, Behaarung kurz, anliegend.

Länge (total), 10 Millimeter; Breite (Prothorax), 2 Millimeter.

SAMAR (*Baker*).

Allotypus im Dresdener Museum.

Die Ausfärbung ist sehr hell, es liegt ohne Zweifel ein unreifes Exemplar vor, die normale Farbe dürfte, wie bei allen anderen Arten, violettbraun sein. Von allen anderen Arten kommt *diabolus* Kleine als nächstverwandte Art allein in Frage, nur damit ist *setosus* zu vergleichen; *diabolus* unterscheidet sich folgendermassen: Der Kopf hat keine schmale Mittelfurche, das Schild des Metarostrums ist von ganz anderer Form und auf dem Diskus mit Exsudatgruben besetzt. Die Fühler sind weniger stark nodos. Der Schenkelstiel ist bei *diabolus* weniger schmäler als die Keule, bei *setosus* dagegen schmal, stielartig. Der Begattungsapparat wird die Artsicherheit bestätigen, leider lag kein Mann vor.

ARRHENODINI

Genus **AGRIORRHYNCHUS** Power

Agriorrhynchus POWER, Pet. Nouv. Ent. 2 (1878) 241.

Agriorrhynchus ignarus sp. nov. Tafel 1, Fig. 5, 6, und 7.

Rotbraun, Kanten an Kopf, Rüssel, und Fühlern, Halsrand des Prothorax, Schenkel und Schienen an Basis und Spitze schwarz, Prothorax an den Seiten mit dunklen, unscharfen Längsstreifen, am ganzen Körper hoch glänzend. Kopf keilförmig, Punktierung sehr fein und zerstreut, Zahnung des Rüssels in Seitenansicht (Tafel 1, Fig. 5). Fühler robust, das erste Glied krugförmig, das zweite bis neunte breiter als lang, nach vorn an Breite ab- und an Länge zunehmend, Hinterkanten gerundet, Vorderkanten scharf, das zehnte quadratisch, beiderseits scharfkantig, das elfte konisch, länger als das neunte und zehnte zusammen, basale Glieder ganz unbehaart, nach vorn zu an Behaarung zunehmend, das zehnte und elfte mit dichter Unterbehaarung. Prothorax ohne sichtbare Punktierung, die im hinteren Drittel liegenden groben punktartigen Vertiefungen sehr flach. Elytren normal, Schmuckzeichnung wie in Tafel 1, Fig.

6. Beine normal. Metasternum gefurcht, fast unpunktiert. Das erste und zweite Abdominalsegment flach vertieft, keine Skulptur auf allen Segmenten.

Länge (total), 2.2 Millimeter; Breite (Prothorax), 4.5.

LUZON, Laguna, Los Baños, 23ter März, 1915 (*Banks*).

Die neue Art sieht *quadrituberculatus* Senna ähnlich, unterscheidet sich durch die Behaarung des Rüssels, durch andere Anordnung der Schmuckzeichnung der Elytren und den gänzlich andern Penis.

Es ist sehr interessant, dass die Gattung bis zu den Philippinen vorgedrungen ist, denn bisher waren zwei Arten von den Sundainseln und eine von Burma bekannt. Im Penisbau besteht grössere Anlehnung an *undulatus* Power, der *ignarus* sonst aber nicht ähnlich ist. Die Festlegung der *Agriorrhynchus*-Arten stösst auf keine Schwierigkeit; das Gattungsbild wird durch *ignarus* nicht beeinträchtigt, im Gegenteil, eher vertieft.

Genus **EUPEITHES** Senna

Eupeithes SENNA, Ann. Mus. Civ. Stor. Nat. Gen. (2) 19 (39) (1898) 381.

Eupeithes dominator Kleine.

Eupeithes dominator KLEINE, Ent. Bl. 17 (1921) 7/9 125.

SAMAR, Wright (*R. C. McGregor*).

Von dieser schönen Art fand ich auch das Weibchen vor. Die Differenzen gegen den Mann sind die üblichen. Die Vorderbeine waren mässig vergrössert. Nur von den Philippinen bekannt.

Genus **PROPHTHALMUS** Lacordaire

Prophthalmus LACORDAIRE, Gen. Col. 7 (1866) 427.

Prophthalmus longirostris Gyllenhal.

Prophthalmus longirostris GYLLENHAL, in Schoenh. Gen. Curc. 1 (1833) 323.

MINDANAO, Davao, Cabadbaran River (*Weber*), Davao (*Weber*).

Leider stand kein Männchen zur Verfügung. Ich kann das Tier nur zu *longirostris* bringen, es kommt keine andere Art in Frage; die Verbreitung ist über Java bis Celebes festgestellt. Es ist sehr naheliegend, dass auch die Philippinen bewohnt sind, umsomehr, als der sehr ähnliche *assimilis* in Tonkin und Süd China gefunden worden ist.

Prophthalmus tricolor Power.

Prophthalmus tricolor POWER, Ann. Soc. Ent. Fr. V **8** (1878) 38.

MINDANAO, Davao, Cabadbaran River (*Weber*); Butuan, Agusan (*Weber*). BOHOL (M. Ramos).

Alle Exemplare gehören der forma *philippinensis* an.

Genus **BARYRRHYNCHUS** Lacordaire

Baryrrhynchus LACORDAIRE, Gen. Col. **7** (1866) 428.

Baryrrhynchus schroederi Kleine.

Eupsalomimus schroederi KLEINE, Stett. Ent. Ztg. (1914) 172.

MINDANAO, Butuan, Agusan River (*Weber*); Lanao, Kolambugan (*Banks*); schon bekannt.

Genus **AMPHICORDUS** Heller

Amphicordus HELLER, Philip. Journ. Sci. § D **8** (1913) 151.

Amphicordus improportionalis Heller.

Amphicordus improportionalis HELLER, Philip. Journ. Sci. § D **8** (1913) 152.

MINDANAO, Lanao, Kolambugan (*Banks*).

Die wenigen bekannt gewordenen Stücke stammen alle von Mindanao.

Genus **CAENORYCHODES** Kleine

Caenorychodes KLEINE, Arch. Nat. A 9, **86** (1920) 87.

Caenorychodes serrirostris Fabricius.

Caenorychodes serrirostris FABRICIUS, Syst. El. **2** (1801) 553.

MINDANAO, Butuan, Agusan River (*Weber*).

Diese häufige und weit verbreitete Art ist auch auf den Philippinen nicht selten.

Genus **PSEUDORYCHODES** Senna

Pseudorychodes SENNA, Ann. Soc. Ent. Belg. **38** (1894) 375.

Pseudorychodes praeclarus sp. nov. Tafel 1, Fig. 8.

Männchen.—Kastanienbraun, Halsring des Prothorax, Kanten des Rüssels und Vorderkanten der Fühlerglieder und die Schenkel an der Basis verdunkelt; am ganzen Körper hochglänzend. Kopf gewölbt, breiter als lang, ungefurcht, einzeln aber sehr deutlich punktiert, Unterseite mit einer Reihe weitstehender, zarter Punkte in welchen ein längeres, anliegendes Haar steht.

Metasternum lang-elliptisch, muldenförmig, ausgehöhlt, Mesorostrum normal erweitert, gewölbt, flach gefurcht, Prorostrum jederseits mit entferntstehenden Dornen, Punktierung auf dem Meta- und Mesorostrum wie auf dem Kopf, Prorostrum mit warzigen Erhebungen. Fühler normal. Prothorax eiförmig mit sehr feiner, zerstreuter Punktierung. Elytren am Absturz gerundet, die siebente Rippe im hinteren Drittel mit zwei entferntstehenden Punkten, in jedem Punkt ein kräftiges, abstehendes Haar; Schmuckzeichnung, Tafel 1, Fig. 8. Beine normal. Metasternum und Abdomen gefurcht, Skulptur äusserst zart, ersteres an den Seiten mit einer Reihe grosser, tiefer Punkte.

Länge (total), 10 Millimeter; Breite (Prothorax), 1.75.

MINDANAO, Surigao (*Böttcher*).

Holotypus im Dresdener Museum.

Die nächstverwandte Art dürfte *fruhstorferi* Senna sein. Sie ist die einzige Art, die basal auf der dritten und fünften Rippe Schmuckzeichnung hat. Abgesehen von diesem übereinstimmenden Merkmal sind die Anlagen der Elytrenzeichnung bei beiden Arten sehr verschieden. Weitere Differenzen gegen *fruhstorferi:* Kopf nicht gefurcht, das vierte bis achte Fühlerglied länger als breit, Prothorax ohne jede Querrunzelung.

BELOPHERINI

Genus **HENARRHENODES** Heller

Henarrhenodes HELLER, Philip. Journ. Sci. § D 8 (1913) 152.

Henarrhenodes macgregori Heller.

Henarrhenodes macgregori HELLER, Philip. Journ. Sci. § D 8 (1913) 153.

LUZON, Benguet, Irisan River (*McGregor*).

Diese prachtvolle Art ist nur von den Philippinen bekannt, scheint aber ziemlich verbreitet zu sein.

Genus **ECTOCEMUS** Pascoe

Ectocemus PASCOE, Journ. Ent. 1 (1862) 388.

Ectocemus badeni Kirsch.

Ectocemus badeni KIRSCH, Mitt. Zool. Mus. Dresden 1 (1875) 48.

MINDANAO, Lanao, Kolambugan (*Banks*).

Auf den Philippinen nicht selten, ich sah sie auch von Celebes. Die Anordnung der Schmuckzeichnung lässt auch darauf schliessen, dass die Art mit den Molukkentieren und nicht mit den Asiaten verwandt ist.

Genus **APOCEMUS** Calabresi

Apocemus CALABRESI, Bull. Soc. Ent. Ital. (II et III) 53 (1921) 58.

Apocemis ignobilis sp. nov. Tafel 1, Fig. 9.

Weibchen.—Blauschwarz, Prothorax kirschrot, vordere Hälfte schwärzlich, Metasternum und Abdomen kirschrot, letzteres in der Mittelfurche und Quernaht dunkler, am ganzen Körper hoch glänzend. Kopf gewölbt, ungefurcht, Unterseite glatt, ohne Skulptur. Metarostrum in der vorderen Hälfte gefurcht, oberseits überall mit kraterähnlichen Punkten, Seiten mit einigen grossen, tiefen Punkten, Unterseite am Mesorostrum flach, quer gerunzelt, Mesorostrum länger als breit, in der basalen Hälfte mit kräftiger Mittelfurche, die in der vorderen Hälfte ganz flach ist, Skulptur wie auf dem Metarostrum; Prorostrum fadenförmig, in der basalen Hälfte mit einzelnen, schmalen, langelliptischen Erhöhungen, auf denen ein kraterähnlicher Punkt steht, vordere Hälfte einzeln, zart punktiert. Das erste Fühlerglied keulig, das zweite etwas kürzer als das erste, das dritte kürzer als das zweite, das kürzeste von allen, das vierte so lang wie das zweite und dritte zusammen, bis zum siebenten an Länge zunehmend, das achte bis zehnte gleichlang, das elfte verlängert, das zweite bis sechste an der Spitze nodos verdickt, vom fünften ab behaart, die Behaarung nach den vorderen Gliedern an Dichte zunehmend. Prothorax auf der Mitte mit lang-elliptischem, mattem, quergerunzeltem Fleck, sonst ohne Skulptur. Elytren normal. Beine desgleichen. Metasternum und Abdomen einzeln, zerstreut punktiert, ersteres in der Mitte einzeln behaart.

Länge (total), 21 Millimeter; Breite (Prothorax), 3.

LUZON, Bataan, Lamao (*W. D. Carpenter*).

Obgleich nur ein weibliches Tier vorliegt, besteht doch kein Zweifel dass die Art zu *Apocemus* gehört. Bisher ist nur *conciliator* Kirsch von Malakka bekannt.

Es ist möglich, dass sich auf der dritten Rippe apical ein mehr oder weniger langer roter Streifen bilden kann; das mir vorliegende Tier hatte nur einen kleinen roten Punkt. Die reduzierte, langstreifige Schmuckzeichnung ist für die Philippinen-Fauna charakteristisch.

ITHYSTENINI

Genus **HETEROPLITES** Lacordaire

Heteroplites LACORDAIRE, Gen. Col. 7 (1866) 471.

Heteroplites erythroderes Boheman.

Heteroplites erythroderes Boheman, SCHOENHERR, Gen. Curc. 5 (1840) 564.

LUZON, Ilocos Norte, Bangui (*Banks*): Nueva Vizcaya, Imugan.

Nur von den Philippinen bekannt.

Heteroplites spinifer Kleine.

Heteroplites spinifer KLEINE, Arch. Nat. A 10, 87 (1921) 36.

POLILLO (*McGregor*). BOHOL, Bilar (*Ramos*).

Nur von den Philippinen bekannt.

Genus **DIURUS** Pascoe

Diurus PASCOE, Journ. Ent. 1 (1862) 392.

Diurus furcillatus Gyllenhal.

Diurus furcillatus GYLLENHAL, SCHOENHERR, Gen. Curc. 1 (1833) 359.

LUZON, Ilocos Norte, Bangui (*Banks*). MINDANAO, Davao, Davao (*Weber*). MINDORO, Baco River (*McGregor*).

Weit verbreitete, häufige Art, von den Philippinen schon bekannt.

PSEUDOCEOCEPHALINI

Genus **HORMOCERUS** Schoenherr

Hormocerus SCHOENHERR, Curc. Disp. (1826) 70.

Hormocerus reticulatus Fabricius.

Hormocerus reticulatus FABRICIUS, Syst. El. 2 (1801) 552.

MINDANAO, Davao, Davao (*Weber*). BORNEO, Sandakan (*J. E. Wahr*).

Gemein von Ceylon bis zur Ostküste Australiens.

Genus **SCHIZOTRACHELUS** Lacordaire

Schizotrachelus LACORDAIRE, Gen. Col. 7 (1866) 454.

Schizotrachelus bakeri Kleine.

Schizotrachelus bakeri KLEINE, Arch. Nat. A 10, 87 (1921) 33.

NEGROS, Occidental Negros, Fabrica (*Schultze*).

Nur von den Philippinen bekannt.

Schizotrachelus imitator sp. nov. Tafel 1, Fig. 10 und 11.

Dem *Schizotrachelus angulaticeps* Senna habituell gleich, durch folgende Merkmale unterschieden: Auf den Elytren fehlt der neben der Sutura liegenden helle Streifen. Der Kopf ist seitlich parallel, nicht gegen den Rüssel verengt, die Augen stehen mehr vor. Das Metarostrum ist breit und tiefgefurcht, das Prorostrum ohne Furche, während bei *angulaticeps* das Metarostrum schmäler gefurcht ist und dem Prorostrum, wenigstens in der basalen Hälfte, niemals die Furche fehlt. Fühler gedrungen (Tafel 1, Fig. 10), die Glieder niemals perlig oder gar länger als breit. Prothorax gänzlich unpunktiert, auch über den Hüften fehlen die Punkte. Hinterschienen schmal, im Gegensatz zu den sehr breiten Schienen bei *angulaticeps*. Paramerenlamellen lang, bei *angulaticeps* kurz.

Länge, Männchen, Weibchen (total), 10 bis 19 Millimeter; Breite (Prothorax), 1.2 bis 2 Millimeter.

LUZON, Burauen, Balbalason, San Miguel. POLILLO. LEYTE. PANAON. CAMIGUIN. CATANDUANES, Vivac.

Sieben Männchen, 8 Weibchen (*Böttcher*).

Holo- und Allotypus im Dresdener Museum.

Von Mindoro, St. Theodora, sah ich mehrere Stücke von hellkastanienbrauner Farbe, die sich habituell von *imitator* nicht unterscheiden. Der Begattungsapparat stimmt in allen untersuchten Exemplaren überein. Ich unterlasse eine Benennung, da es sich wahrscheinlich nur um immature Stücke handelt.

Schizotrachelus imbricellus sp. nov.

Männchen.—Einfarbig schwarz, mit schwachem Metallglanz, am ganzen Körper hochglänzend. Kopf oblong, länger als breit, Seiten flach parallel, am Hinterrand schwach verengt, Oberseite gewölbt, Hinterrand breit und tief dreieckig eingekerbt, die Einkerbung in eine kräftige kurze Einkerbung fortgesetzt, die mit der zwischen den Augen beginnenden Rüsselfurche in keiner Verbindung steht, Punktierung einzeln, zerstreut; Seiten und Unterseite gleich skulptiert, letztere am Hinterrand und ein schmaler Längsstreifen matt, chagriniert. Metarostrum kürzer als das Prorostrum, gegen das Mesorostrum etwas verschmälert, flach gefurcht, Oberseite matt, seitlich mit einigen matten Flecken, die vom Kopf kommende matte Mittelfurche setzt sich auf das Metarostrum fort; Mesorostrum flach, Mittelfurche in der basalen Hälfte schmal, in der vorderen breiter werdend, Punktierung einzeln, Prorostrum gegen den Vorderrand schwach erweitert, in den basalen zwei Dritteln gefurcht, Punktierung am Vorderrand dichter, Vorderrand tief eingebuchtet. Fühler kurz, zart, das zweite und vierte bis zehnte Glied perlig, das elfte konisch, so lang wie das neunte und zehnte zusammen, Behaarung zart und einzeln, das neunte und zehnte Glied nur in der vorderen Hälfte dicht und grubig skulptiert. Prothorax schlank, Punktierung in der basalen Hälfte gross und grob, zum Teil filzig, nach vorn nimmt die Punktierung ab und verschwindet ganz. Elytren parallel, an den Seiten sind die erste, zweite, und vierte Rippe obsolet, die anderen erhöht, Hinterecken stumpflich gerundet, Hinterrand neben der Sutura flach aber deutlich nach innen gebuchtet, die achte Rippe am Absturz stark verdickt, Punktierung sehr gross und einzeln. Hinterschienen verbreitert, Beine sonst normal. Metasternum nur an der Basis kurz und flach gefurcht, an den Seiten mit einer groben Punktreihe, das erste und zweite Abdominalsegment kräftig gefurcht, Skulptur wie auf dem Metasternum.

Länge (total), 11 Millimeter; Breite (Prothorax), 1.2 Millimeter.

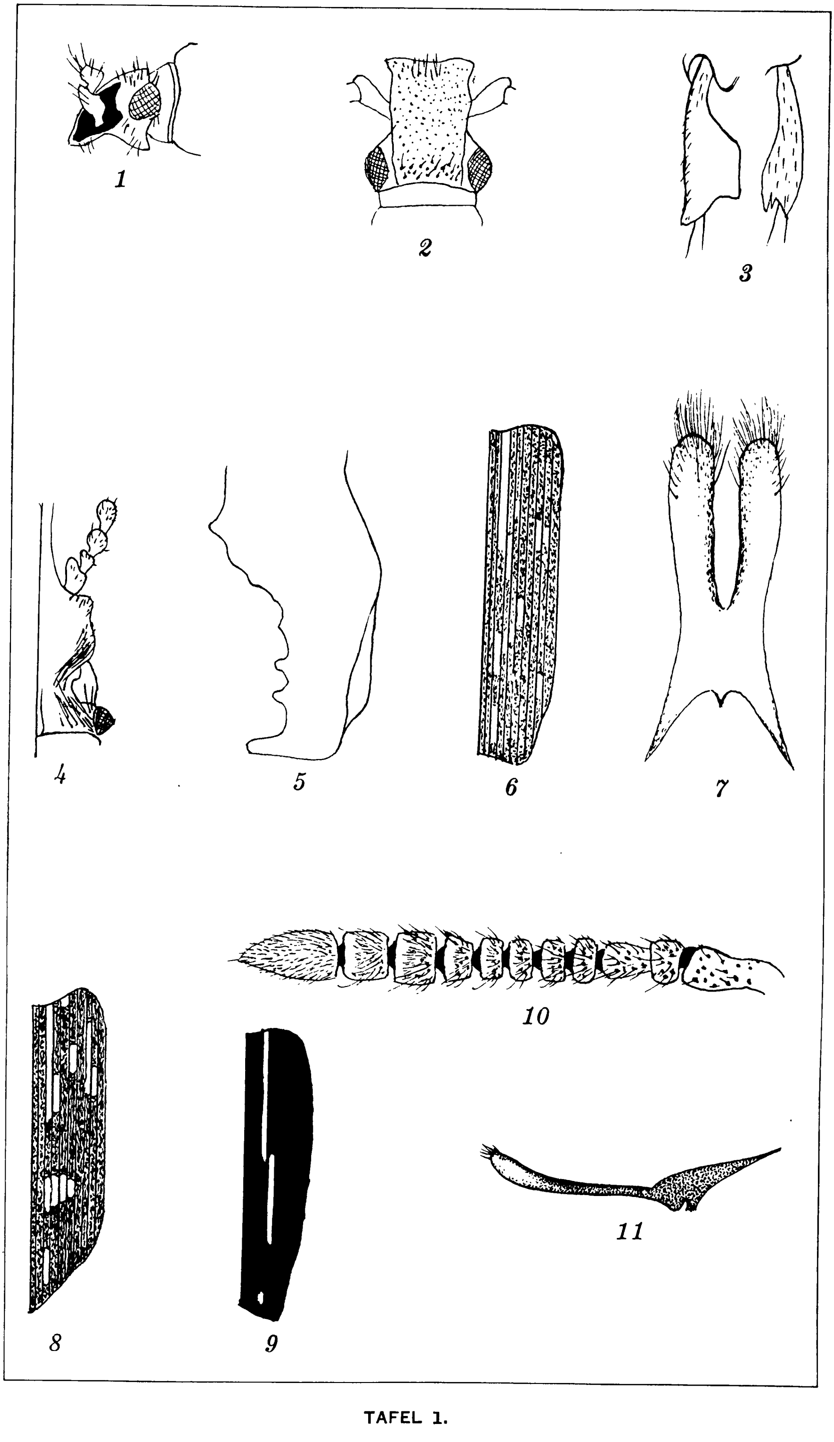
LUZON, Laguna, Mount Banahao.

In meiner Bestimmungstabelle kommt man zu *angulaticeps* und *imitator,* von denen der tiefpunktierte Prothorax, die grobpunktierten Elytren, die am Absturz stark verdickte achte Rippe, und die an der Basis zum Teil obsoleten Rippen trennen. Die Paramerenlamellen sind schmal und sehr lang.

ILLUSTRATIONEN

TAFEL 1

FIG. 1. *Atopomorphus schultzei* sp. nov., Kopf in Seitenansicht.
2. *Atopomorphus schultzei* sp. nov.; Kopf in Ansicht von oben.
3. *Atopomorphus schultzei* sp. nov.; Hinterschiene in Ansicht von hinten und von der Seite.
4. *Paramorphocephalus setosus* sp. nov.; Kopf und Metarostrum.
5. *Agriorrhynchus ignarus* sp. nov.; Rüssel in Seitenansicht.
6. *Agriorrhynchus ignarus* sp. nov.; Elytrenzeichnung.
7. *Agriorrhynchus ignarus* sp. nov.; Parameren.
8. *Pseudorychodes praeclarus* sp. nov.; Schmuckzeichnung.
9. *Apocemis ignobilis* sp. nov.; Elytrenzeichnung.
10. *Schizotrachelus imitator* sp. nov.; Fühler.
11. *Schizotrachelus imitator* sp. nov.; Parameren.



TAFEL 1.

DESCRIPTION DE TROIS ESPÈCES NOUVELLES DE GALERUCINI DES PHILIPPINES

Par V. Laboissière

Levallois-Perret (Seine), France

AVEC UNE FIGURE DE TEXTE

Oides bakeri sp. nov. Fig. 1.

En ovale court. Entierèment jaune ferrugineux brillant, plus pâle sur la tête, le pronotum et les antennes; yeux et sommets des mandibules noirs.

Labre étroitement mais profondément échancré, épistôme surmonté d'une carène large, convexe, se soudant à son sommet aux calus surantennaires; ceux ci petits, transversaux et limités en dessus par un sillon droit, coupé dans son milieu par une légère fossette, continuée par un fin sillon coupant le vertex. Antennes allongées atteignant la moitié des élytres, les troisième et quatrième articles égaux; les articles 7 á 9 un peu plus épais.

Pronotum transversal, environ deux fois plus large que long; bords latéraux droits et parallèles, bord antérieur légèrement élevé sur son milieu, assez fortement échancré, et parallèle à la base qui est arquée; les angles antérieurs sont droits, émoussés; les postérieurs obtus. Surface convexe, lisse, sans trace d'impression. Ecusson triangulaire, allongé, arrondi au sommet.

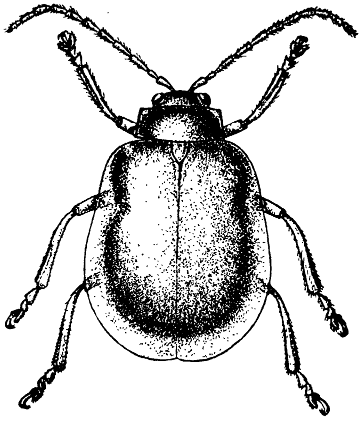


FIG. 1. *Oides bakeri* sp. nov.

Elytres bien plus larges que le pronotum à la base, fortement élargis et arrondis en arrière; très amples et convexes, ils sont fortement impressionnés sur le côté vers le premier tiers, leur surface est marquée d'une ponctuation extrèmement fine, un court sillon longe la suture en arrière de l'écusson; les épipleures sont courts, situés à la hauteur du bord latéral à leur base, ils se contournent et s'en éloignent vers la moitié de leur longueur.

Dessous ferrugineux. Prosternum très étroit mais visible entre les hanches. Longueur, 7.75 á 8.5 millimètres; largeur, 5 á 6 millimètres.

Mâle, sommet du dernier segment abdominal trilobé, le lobe médian concave et incliné dans la cavité anale.

MINDANAO, Davao (*Baker 8564*).

Oides ovalis sp. nov.

En ovale allongé. Jaune pâle brillant, yeux, sommets des mandibules et quatre derniers articles des antennes, bruns ou noirs, le septième article des antennes est plus ou moins rembruni.

Labre largement et peu profondément échancré, garni de poils assez nombreux ainsi que l'épistôme, ce dernier est surmonté d'une carène triangulaire et convexe; les calus surantennaires sont ovales, convexes, ils sont limités en dessus par un sillon profond en forme d'accolade, le vertex est creusé d'une large impression triangulaire, plus profonde dans son milieu qui est traversé par un sillon longitudinal.

Pronotum transversal, environ deux fois et demie plus large que long, rebordé sur son pourtour; les bords latéraux faiblement arrondis, s'élargissant de la base jusqu'au-dessous de leur milieu et convergents ensuite vers le sommet, tous les angles sont obtus arrondis; le bord antérieur est faiblement échancré; la base est oblique en arrière des angles et sinuée sur son milieu, la surface est peu convexe très éparsement et finement ponctuée, marquée en outre de quatre impression, une en forme de sillon transversal longe le milieu du bord antérieur qui se trouve de ce fait assez fortement élevé, deux transversales assez larges mais peu profondes sont situées de chaque coté sur le milieu non loin des bords latéraux, la dernière très petite est placée au-dessus de milieu de la base. Ecusson en triangle allongé un peu convexe et lisse.

Elytres en ovale allongé, plus larges que le pronotum à la base, régulièrement mais faiblement arrondis de la base au sommet, leur surface est convexe couverte d'une ponctuation fine et assez dense; l'impression située sur la partie latérale antérieure est peu profonde, le bord latéral sur sa première moitié est assez largement explané, il est retombant ensuite jusqu'au sommet; en arrière de l'écusson la suture est longée sur une faible longueur par un sillon ce qui la fait paraitre élevée. Repli épipleural court et très éloigné du bord latéral.

Dessous jaune pâle ainsi que les pattes; ongles roux. Longueur, 7 á 8.5 millimètres; largeur, 4.25 á 5 millimètres.

LUZON, Mount Maquiling (*Baker 2074, 2427*); Mount Banahao (*Baker 4695*).

L'individu recueilli au Mount Banahao est plus pâle, les antennes sont à peine rembrunies sur les deux derniers articles seulement, l'impression frontale est plus accentuée, les bords latéraux du pronotum sont moins nettement arrondis et plus anguleux enfin la ponctuation des élytres est plus fine, mais je ne crois pas qu'il appartienne à une autre espèce.

Dercetes variipes sp. nov.

Jaune d'ocre brillant; deux derniers articles des antennes bruns, sommets des mandibules noirs; le tiers apical des tibias antérieurs, le quart environ des tibias intermédiaires et les tarses de ces deux paires de pattes brun noir, le sommet des tibias et les tarses postérieurs très faiblement rembrunis; tous les ongles roux fauve.

Antennes grèles, filiformes, atteignant le milieu des élytres, le deuxième article ovalaire de moitié moins long que le troisième, le quatrième aussi grand que les deux précédents réunis et plus long que les suivants qui sont égaux entre eux. Sillon transversal profond, lisse, anguleux dans son milieu, quelques rides droites partent de ce sillon et remontent vers le vertex.

Pronotum transversal, environ deux fois et demie plus large que long, finement rebordé sur son pourtour; le bord antérieur est échancré et parallèle à la base qui est arrondie; les bords latéraux sont très faiblement arqués et convergent en avant; les angles antérieurs sont épaissis, saillants et forment une petite dent en dehors, les angles postérieurs sont obtus. Le surface est convexe et lisse. Ecusson triangulaire faiblement convexe, lisse.

Elytres parallèles sur le premier tiers, faiblement dilatés ensuite en arrière et séparement arrondis au sommet. Surface fortement convexe, marquée d'une impression oblique très nette en dedans des calus huméraux, et de deux autres latérales situées vers le premier tiers; de chaque côté de la suture, sur sa partie antérieure, se remarque un sillon assez grossement ponctué au fonds, s'arrètant à la dépression transversale; tout le reste de la surface est couvert d'une ponctuation assez serrée, fine et régulière.

Dessous un peu plus clair que le dessus, garni d'une pubescence peu serrée très fine et courte. Les pattes sont plus densément pubescentes, le premier article des tarses postérieurs est aussi long que les trois suivants réunis. Longueur, 7 millimètres; largeur, 3.75 millimètres.

LUZON, Laguna, Mount Maquiling (*Baker 2428*).

Sermyloides banksi Weise.

Sermyloides banksi WEISE, Philip. Journ. Sci. § D 8 (1913) 231, ♂.

Femelle, antennes filiformes atteignant le tiers postérieur des élytres, les troisième et quatrième articles grands égaux, les suivants plus courts. La face de la tête est un peu moins concave que chez le mâle. Le labre est largement bordé de blanc.

LUZON, Mount Banahao (*Baker 4688*).

ILLUSTRATION

FIGURE 1. *Oides bakeri* sp. nov.

ERRATA

VOLUME 26

Page 418, insert at bottom of page, *Type locality.*—Surigao, Surigao (*Baker*).

VOLUME 27

Page 90, line 33, for *hirtifrons* read *argentifrons.*

Page 426, line 11, *for* (Philippinen) *read* (Borneo und Sumatra).

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The Philippine Journal of Science is issued twelve times a year. The sections were discontinued with the completion of Volume XIII (1918).

Yearly subscription, beginning with Volume XIV, 5 dollars United States currency. Single numbers, 50 cents each.

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